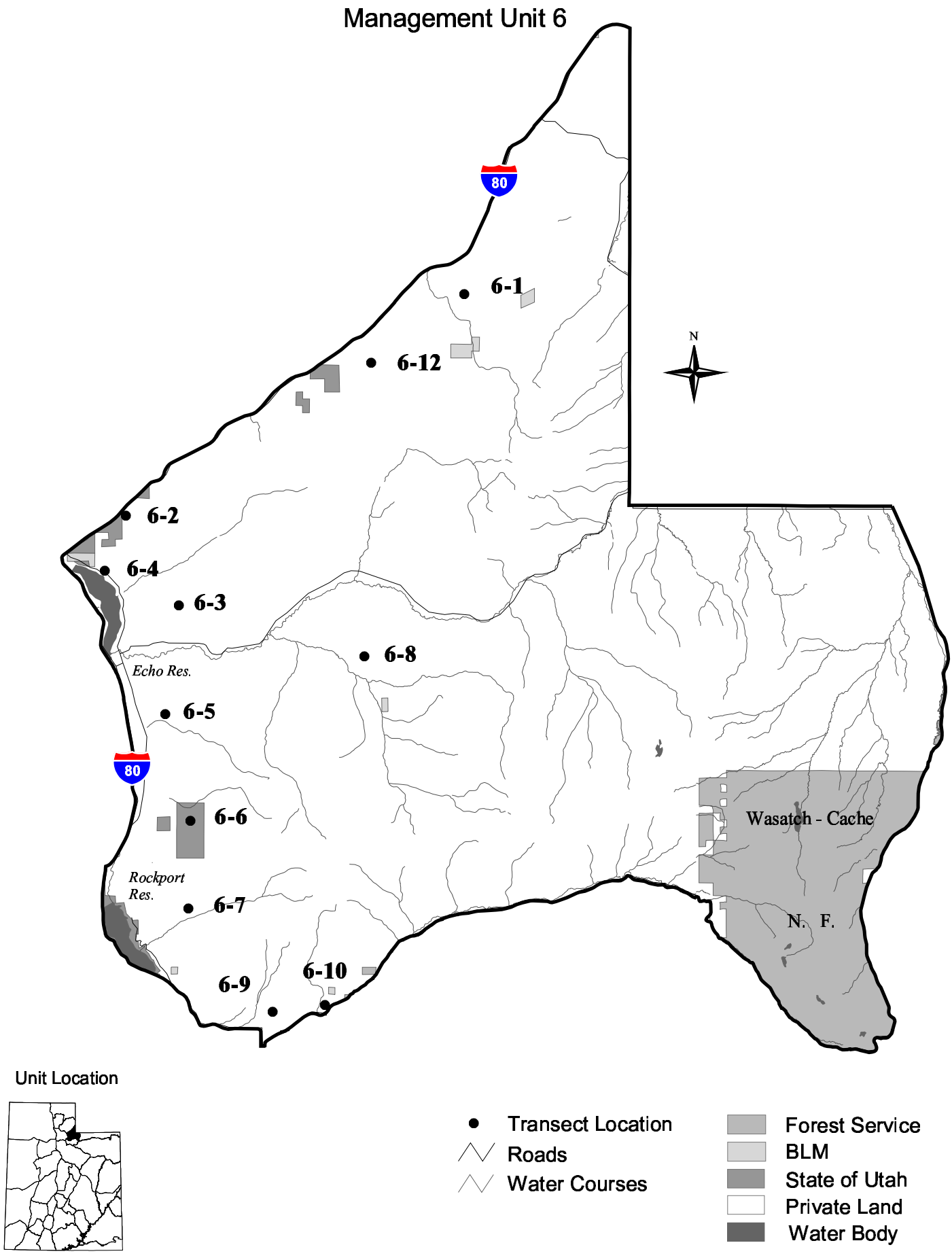

Management Unit 6
80
6-1
6-12
N
6-2
6-4
6-3
6-8
Echo Res.
6-5
80
6-6
Wasatch - Cache
Rockport
Res.
6-7
N. F.
6-9
6-10
Unit Location
Transect Location
Roads
Water Courses
Forest Service
BLM
State of Utah
Private Land
Water Body

WILDLIFE MANAGEMENT UNIT 6 - CHALK CREEK

Boundary Description

Summit and Duchesne counties - Boundary begins at the junction of Interstates 84 and 80 near Echo; then northeast on I-80 to the Utah-Wyoming state line; south and east along this state line to Highway SR-150; south on SR-150 to Pass Lake and the Weber River Trail; west on this trail to Holiday Park and the Weber River road; west on this road to Highway SR-32; north and west on SR-32 to I-80 and Wanship; north on I-80 to I-84 near Echo.

Management Unit Description

Management unit 6 contains an estimated 395,397 total acres (summer and winter ranges combined) of mule deer range, of which 90% lies on private land. Unit 6 contains an estimated 435,170 total acres of elk range, of which 91% lies on private lands. Widespread private ownership, and subsequent control of the land, leads to numerous management complications. Unregulated development and loss of habitat are some of the biggest problems. The discovery, development, and removal of oil throughout the unit, especially the Chalk Creek area, has led to increased road and housing developments. Agricultural projects on critical winter range also continue to increase depredation problems and further decrease the range available to big game. Because of the preponderance of private land and the establishment of hunting clubs, access is severely restricted for trophy hunting on large portions of the unit. Private landowners are also less likely to undertake extensive rehabilitation projects to improve the value of the remaining range for wildlife. This unit has the largest acreage requirement of range needed to be acquired for any herd unit in the state. Unfortunately, the high cost of the land would probably prevent the acquisition of this critical range.

The topography of the unit is influenced mainly by the Uinta mountains to the east, with their drainages flowing through long, gradual slopes down into the Weber River Valley. Other major drainages include Crandall Canyon, Chalk Creek, Echo Canyon, Hixon and Pecks Canyons, and Grass Creek. The southern exposures of these canyons are especially important winter range. The rest of the winter range is found in the low rolling foothills of the western and central parts of the unit. The upper limits vary between approximately 6,800 and 7,200 feet (Giunta 1979).

Towns are located in the valley along the Weber River. They include Peoa, Wanship, Hoytsville, and Coalville. Echo and Rockport reservoirs, located on the west side of the unit on the Weber River, are both significant barriers to big game movement. Additionally, I-80 through Echo Canyon serves to discourage big game movement, and deer losses are high on the highway in winter and spring.

In the 1977 range inventory, the winter range was classified into 12 distinct vegetation types (Giunta 1979). Of these, seven of the larger, more important types were sampled. The sagebrush-grass and oakbrush types were the most prevalent. The sagebrush-grass type is quite variable with basin big sagebrush, mountain big sagebrush, and Wyoming big sagebrush all occurring within the unit, being found on a variety of exposures, slopes, and elevations. In the 1977 inventory, it occupied 36% of the normal winter range and produced 33% of the total production. It was even more important on severe winter range, occupying 43% of the available range. The oakbrush type, which covered 32% of the winter range, was the most productive type, but becomes largely unavailable in severe winters. This type intergrades with the sagebrush-grass and other types. Other important types are juniper, especially important for thermal cover, and mountain brush. Air dry production from the 1977 range inventory report are as follows: aspen, 435 lbs/acre; juniper, 240 lbs/acre; sagebrush-grass, 383 lbs/acre; mountain brush, 510 lbs/acre; oakbrush, 580 lbs/acre; grassland, 285 lbs/acre.

Fires in recent years have destroyed large tracts of important range in the Chalk Creek unit. Because of this habitat loss, increasing numbers of mule deer, elk, and moose tend to concentrate in the lower areas on agricultural land and at mouths of canyons, especially during severe winters.

Big Game Management Objectives

Management options are rather limited in this herd unit because of the prevalence of private land on both winter and summer ranges. The herd unit management plan in 1983 (Kearl 1983) stated a harvest objective of 2,500 to 3,000 bucks per year and outlined various management programs and numerous problems with possible solutions. In the 1998 management plan, annual buck harvest was expected to be about 1,600 under normal conditions, with a target population size of 11,500 wintering animals (modeled number). This is significantly lower than the 1983 plan. It is more practical to look at the regression of buck harvests since 1950 to get a better understanding of the overall trend since then. The analysis demonstrates an increased buck harvest since 1950 even with the great deal of variation for buck harvest beginning with 2,031 and increasing to 2,323 in 1990. This variation can be further depicted by some low harvests in the 1950's, 60's, and 70's of around 900, and high harvests of over 3,000 in the mid-50's and early-80's. Management of the deer herd is further complicated by the presence of other big game species, migrations, excessive road kills on I-80, and many hunting restrictions. Elk management objectives (1998) call for a target winter herd size of 1,900 animals, a postseason bull to cow ratio of 8:100, with at least 4 bulls being 2½ years or older.

A serious problem in this unit is the composition of herbaceous understories, which on most sites is mostly made up of annual species, primarily cheatgrass. Understories that are dominated by annual species can prohibit sagebrush seedling establishment, especially during Utah’s hot, dry summers. Another serious concern is the rapidly increasing loss of critical wintering habitat through urbanization. A DWR program to acquire additional land and/or conservation easements, and landowner cooperation are necessary to help perpetuate the big game herds on this unit.

Range Trend Studies

A total of 12 trend studies are located in management unit 6. All of the transects established in 1984 were located on important big game winter ranges. Six of the 19 line intercept transects established in 1977 were in areas considered important for continued monitoring. These transects were reread and replaced with new interagency trend studies. In addition, 1 new study was established in 1990, and another in 1996. All of the transects in this unit are located on private land, except the Hixon Canyon and Echo Canyon Rest Area studies which are located on DWR property. All of the trend studies that were established in 1984 were reread in 1990. Project personnel attempted to reread all of the trend studies in both 1996 and 2001, but a few of the studies were not read in either 1996 or 2001 due to difficulty getting permission and/or access to privately owned lands.

Trend Study 6-1-01

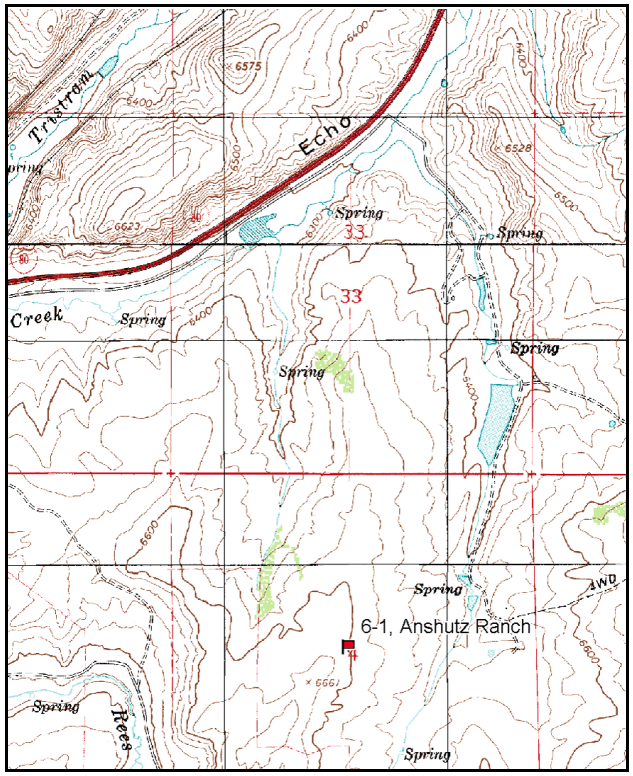
Study site name: Anshutz Ranch . Vegetation type: Low Sagebrush .

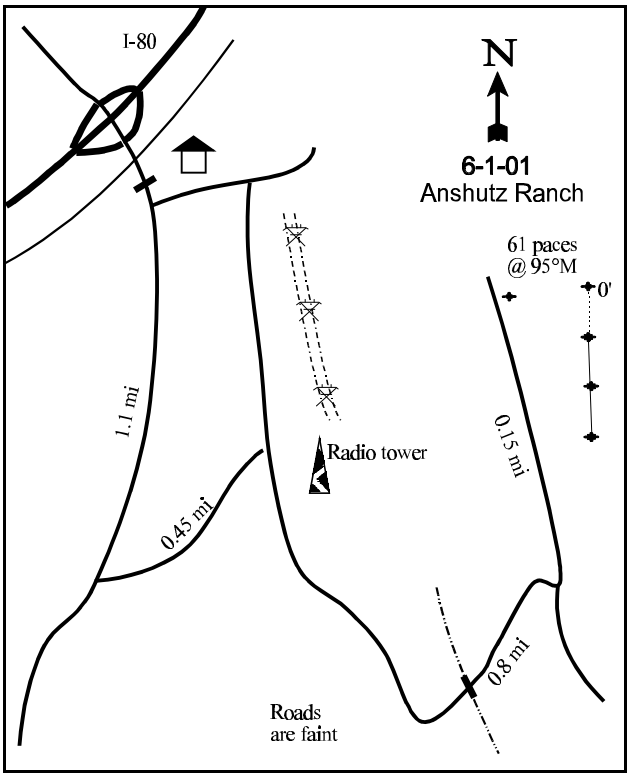
Compass bearing: frequency baseline 163 degrees magnetic.

Frequency belt placement: Line 1 (11 & 95ft), line 2 (34 & 71ft), line 3 (59ft).

LOCATION DESCRIPTION

Proceeding east on I-80 from Echo, leave I-80 at exit number 185 and proceed east to Anshutz Ranch headquarters. From the security guard house proceed 0.1 miles and turn left. Proceed 0.65 miles (passing ranch lumber and equipment yard and a gate)to a faint road to the left. Turn left, proceed 0.8 miles (go through gate) to a crossroad on a small ridge. Turn left(road not on quad and quite faint) and proceed 0.15 miles to a green steel stake on the right(east)side of the road. From stake, walk 51 paces at 95 degrees magnetic to the 0-foot of the baseline marked by browse tag #7949.





Map Name: Castle Rock

Diagrammatic Sketch

Township 4N , Range 7E , Section 4

UTM 4550593 N 486531 E

DISCUSSION

Trend Study No. 6-1

The Anshutz Ranch trend study is located at a moderately high elevation (6,640 feet) southeast of the Anshutz Ranch headquarters. Big game use of the study area is light to moderate and comes chiefly from elk. The area is also important for sage grouse. The land is privately owned and is utilized by sheep, cattle, and horses. Vegetatively, a number of range types are closely intermixed. In swales, grass and/or basin big sagebrush is often predominate. On gentle slopes and flat areas, mixed communities consist mostly of basin big sagebrush and low sagebrush, with Wyoming big sagebrush and possibly mountain big sagebrush occurring occasionally. On the more well-drained ridgetops, low sagebrush is the most common sagebrush. Scattered throughout this area is an abundance of stickyleaf low rabbitbrush and broom snakeweed. In a few places, these two increaser species have gained dominance. The entire area is very open with little protective cover and gently rolling topography. The actual study site slopes gently (5%) to the southeast with vegetation consisting of a mixture of basin big sagebrush and low sagebrush. Broom snakeweed and stickyleaf low rabbitbrush are abundant subdominants. Pellet group transect data taken along the baseline in 2001 estimated 3 deer, 48 elk, and 4 cow days use/acre (8 ddu/ha, 117 edu/ha, and 9 cdu/ha). Horse and sage grouse droppings were also sampled in the transect in 2001.

Soils are moderately deep with an estimated effective rooting depth of nearly 14 inches. The soil is classified as a clay loam, with a slightly alkaline soil reaction (7.6 pH). Percent organic matter is moderate at 2.9%. The soil has some variable-sized rock interspersed throughout the profile. Surface rock and pavement combine to provide 3% average cover in 1996 and 2001. Protective cover provided by vegetation, litter, and cryptogams is abundant. However, most of the vegetative cover comes from shrubs as herbaceous cover is low. Percent bare ground is moderate at almost 21% in 2001, with most of the bare soil being found in sagebrush interspaces. Some localized soil movement is apparent. Phosphorus is low at 5.9 ppm as values less than 10 ppm can be limiting to normal plant growth and development.

Browse composition is dominated by sagebrush, most notably low sagebrush, which contributes 62% and 63% of the total browse cover in 1996 and 2001. Basin big sagebrush, which occurs mostly in the swales where soils are deeper, provides an additional 21% and 18% of the browse cover in 1996 and 2001 respectively. Low sagebrush density is estimated at 9,580 plants/acre in 2001. Mature plants currently (‘01) make up 76% of the population, with an additional 22% of the population being classified as decadent. In addition, 44% (940 plants/acre) of the decadent plants sampled in 2001 were classified as dying. Percent decadence was much lower in 1996 and 2001 compared to the sampling periods of 1984 and 1990 when percent decadence was estimated at 50% and 55% respectively. Use on low sagebrush has been mostly light since 1984 when the majority of the population showed moderate use. Vigor has been generally good in all sampling years. Poor vigor has ranged from 4% in 1996 to 13% in 1990. Recruitment from young plants is low at 2% in 2001. Annual leader growth averaged less than 1 inch in 2001, but seed production was abundant.

Density estimates for basin big sagebrush have varied, with the population currently (‘01) estimated at 3,120 plants/acre. Density estimates in 1984 and 1990 were overestimated due to the small sample sized used during those readings. The much larger sample used in 1996 and 2001 provides more accurate density estimates for shrubs that have clumped and/or discontinuous population distributions. From 1984-1996, use was light to moderate, percent decadence ranged from 20-28%, and vigor was generally good, except in 1996, when poor vigor was estimated in 20% of the population. In 2001, basin big sagebrush displayed light use, good vigor, and moderately high decadency at 35%. In 1996 and 2001, the average number of young in the population was much lower than the number of dead within the population. Annual leader growth averaged just over 1 inch in 2001, and seed production was moderate.

Broom snakeweed and stickyleaf low rabbitbrush occur on the site. They appeared to be increasing in earlier readings (1984 and 1990). However, population density estimates have been much lower in 1996 and 2001. Both species appear to have stable densities as mature plants are the dominant age class in 2001. Snakeweed is more abundant where low sagebrush is dominate.

The herbaceous understory is fairly diverse, but not overly abundant. Composition has been quite variable through time, with perennials showing increased nested frequency values between 1984-1996. However in 2001, sum of nested frequency for all perennial herbaceous species decreased by 29% and cover decreased by half. These decreases, at least in part, are due to the extremely dry conditions during the spring and summer of 2001. Western wheatgrass and Sandberg bluegrass were the dominant perennial grasses in 2001. Western wheatgrass significantly increased in nested frequency, while Sandberg bluegrass increased but not significantly. Bottlebrush squirreltail was abundant in 1984 and 1990, but has steadily decreased since. Annual grasses are present, but not very abundant. In 2001, some utilization on grasses by cattle was noted, especially on plants within the shrub interspaces. Forbs were depleted in 2001 due to the drought. Desert and longleaf phlox were the most abundant perennials, with birdbeak being the most abundant annual species.

1984 APPARENT TREND ASSESSMENT

Soil trend appears stable because of the gentle terrain. If slopes were steeper, the expanse of bare soil in the shrub interspaces would probably allow gully and sheet erosion to occur at a much more rapid rate. Vegetative trend is unclear, but it appears that plant composition is declining in quality because of a shift from sagebrush to rabbitbrush and snakeweed.

1990 TREND ASSESSMENT

Big game use is not concentrated on the large expanse of sagebrush range sampled by this trend study. The big sagebrush, identified as *Artemisia tridentata tridentata*, displays light to moderate hedging. The low sagebrush (*A. arbuscula*) are lightly used. There is a high percentage of decadence in the low sagebrush population, but a large number of young sagebrush were also sampled. Total sagebrush canopy cover is 26%, with equal percentages for both species. Density slightly deceased, while the population continues to be 55% decadent. Broom snakeweed did not increase. The increases in grass frequency are a result of increases in the smaller bunch grasses, this would not include western wheatgrass or bluebunch wheatgrass. Utilization of grasses has been light this year, but overall there is limited herbaceous forage available. Perennial forbs are insignificant. Ground cover percentages are basically unchanged.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)

1996 TREND ASSESSMENT

Big game use remains light for both elk and deer. Soil trend is improving with a decrease in percent bare ground from 23% to 16% since 1990. The browse trend is slightly improved because low sagebrush, which makes up 62% of the browse cover, has improved vigor and percent decadency has declined from 55% to 13%. The other key browse species, basin big sagebrush which accounts for an additional 21% of the browse cover, has also shown a significant reduction in the percentage of plants classified as decadent. The reduction in density for this species is mostly reflective of the much larger sampling design giving a greatly improved density estimate. Broom snakeweed and stickyleaf low rabbitbrush are showing no tendencies toward uncommon increases in their respective densities. The herbaceous understory trend is stable. Sum of nested

frequency for perennial grasses slightly increased, while sum of nested frequency for perennial forbs slightly declined. Cheatgrass, which is a concern on many of the winter ranges in the Northern Region, is moderately low providing only 11% of the herbaceous cover on the site.

TREND ASSESSMENT
soil - slightly up (4)
browse - slightly up (4)
herbaceous understory - stable (3)

2001 TREND ASSESSMENT

Soil trend is stable. Although bare ground slightly increased in percent cover, vegetation and litter remain abundant. Cryptogamic cover also increased in 2001 from 1% to nearly 7%. Trend for browse is stable. Low sagebrush and basin big sagebrush show increases in decadency and the number of decadent plants classified as dying. However, these increases are not unusually large. The number of young in the population for both species is low as well. Better precipitation in the future would help sagebrush reproduction on this site. Broom snakeweed and low rabbitbrush have stable densities at the present time. Trend for the herbaceous understory is slightly down. Sum of nested frequency for all perennial herbaceous species declined by 29% due to spring and summer drought in 2001. A positive aspect to the decrease in herbaceous species is that annual species also declined.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --
Herd unit 06 , Study no: 1

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'84	'90	'96	'01	'84	'90	'96	'01	'96	'01
G	Agropyron smithii	$_{a}$72	$_{a}$71	$_{a}$72	$_{b}$111	25	25	25	43	1.80	.76
G	Agropyron spicatum	$_{a}$4	$_{a}$12	$_{b}$98	$_{a}$27	3	4	38	12	2.77	.38
G	Bromus japonicus (a)	-	-	2	3	-	-	1	2	.03	.03
G	Bromus tectorum (a)	-	-	$_{b}$78	$_{a}$25	-	-	31	13	2.00	.09
G	Carex spp.	-	-	-	2	-	-	-	1	-	.03
G	Oryzopsis hymenoides	3	-	8	-	1	-	4	-	.09	-
G	Poa fendleriana	$_{a}$-	$_{a}$-	$_{b}$26	$_{b}$33	-	-	11	13	.42	.53
G	Poa pratensis	$_{a}$3	$_{a}$8	$_{b}$27	$_{ab}$11	1	3	10	6	.75	.10
G	Poa secunda	$_{a}$76	$_{c}$230	$_{b}$154	$_{b}$182	33	87	55	71	2.01	2.61
G	Sitanion hystrix	$_{b}$118	$_{c}$162	$_{b}$127	$_{a}$32	53	69	56	13	2.63	.46
G	Stipa columbiana	5	23	10	19	3	10	7	8	.35	.16
G	Stipa comata	17	9	14	14	6	3	6	4	.25	.59
Total for Annual Grasses		0	0	80	28	0	0	32	15	2.03	0.12
Total for Perennial Grasses		298	515	536	431	125	201	212	171	11.11	5.64
Total for Grasses		298	515	616	459	125	201	244	186	13.15	5.76

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'84	'90	'96	'01	'84	'90	'96	'01	'96	'01
F	Achillea millefolium	4	13	7	8	2	4	4	4	.07	.21
F	Agoseris glauca	4	3	-	6	2	1	-	2	-	.03
F	Allium acuminatum	$_{b}$44	$_{a}$-	$_{a}$-	$_{a}$-	27	-	-	-	-	-
F	Antennaria rosea	$_{b}$35	$_{c}$82	$_{a}$10	$_{ab}$16	15	35	6	7	.27	.10
F	Arabis spp.	$_{a}$-	$_{c}$22	$_{b}$9	$_{a}$-	-	11	5	-	.02	-
F	Astragalus convallarius	11	5	7	18	5	3	5	8	.12	.19
F	Astragalus utahensis	-	-	-	3	-	-	-	1	-	.03
F	Calochortus nuttallii	8	2	-	-	4	1	-	-	-	-
F	Cirsium undulatum	$_{a}$15	$_{b}$40	$_{a}$12	$_{a}$6	9	22	7	4	.13	.12
F	Collomia linearis (a)	-	-	$_{a}$-	$_{b}$24	-	-	-	10	-	.05
F	Collinsia parviflora (a)	-	-	$_{b}$43	$_{a}$13	-	-	23	6	.14	.03
F	Cordylanthus ramosus (a)	-	-	$_{a}$-	$_{b}$43	-	-	-	23	-	1.39
F	Epilobium brachycarpum (a)	-	-	-	3	-	-	-	1	-	.01
F	Erigeron pumilus	$_{ab}$47	$_{b}$74	$_{a}$31	$_{a}$16	22	35	14	10	.22	.12
F	Eriogonum umbellatum	-	1	3	5	-	1	2	3	.06	.21
F	Gayophytum ramosissimum (a)	-	-	-	4	-	-	-	2	-	.01
F	Holosteum umbellatum (a)	-	-	$_{b}$18	$_{a}$-	-	-	7	-	.03	-
F	Lepidium spp. (a)	-	-	-	7	-	-	-	4	-	.02
F	Linum lewisii	-	-	3	7	-	-	1	3	.03	.04
F	Machaeranthera canescens	-	9	-	-	-	3	-	-	-	.00
F	Phlox austromontana	$_{a}$-	$_{a}$2	$_{b}$60	$_{b}$46	-	2	27	20	1.36	.85
F	Phlox longifolia	$_{a}$40	$_{b}$164	$_{b}$158	$_{a}$39	21	62	63	15	1.16	.20
F	Polygonum douglasii (a)	-	-	$_{b}$85	$_{a}$27	-	-	34	11	1.08	.08
F	Ranunculus testiculatus (a)	-	-	$_{b}$14	$_{a}$5	-	-	7	2	.03	.01
F	Senecio multilobatus	-	-	-	2	-	-	-	1	-	.00
F	Sphaeralcea coccinea	1	2	-	-	1	2	-	-	-	-
F	Taraxacum officinale	$_{a}$-	$_{b}$9	$_{b}$8	$_{ab}$5	-	6	5	2	.05	.01
F	Tragopogon dubius	$_{a}$-	$_{a}$-	$_{b}$11	$_{ab}$3	-	-	5	1	.02	.00
F	Unknown forb-perennial	3	-	-	-	1	-	-	-	-	-
Total for Annual Forbs		0	0	160	126	0	0	71	59	1.29	1.61
Total for Perennial Forbs		212	428	319	180	109	188	144	81	3.54	2.16
Total for Forbs		212	428	479	306	109	188	215	140	4.84	3.77

Values with different subscript letters are significantly different at alpha = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 06 , Study no: 1

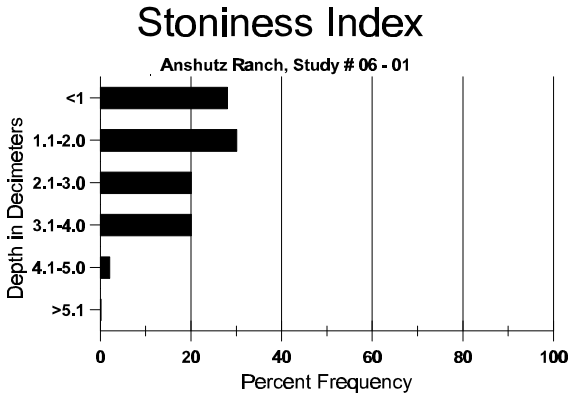
Type	Species	Strip Frequency '96	Strip Frequency '01	Average Cover % '96	Average Cover % '01
B	Artemisia arbuscula	90	86	22.02	20.63
B	Artemisia tridentata tridentata	53	61	7.44	6.64
B	Ceratoides lanata	3	4	-	.01
B	Chrysothamnus viscidiflorus viscidiflorus	94	89	5.53	4.28
B	Gutierrezia sarothrae	18	28	.28	1.20
B	Tetradymia canescens	9	8	.03	.03
Total for Browse		267	276	35.31	32.81

BASIC COVER --
Herd unit 06 , Study no: 1

Cover Type	Nested Frequency '96	Nested Frequency '01	Average Cover % '84	Average Cover % '90	Average Cover % '96	Average Cover % '01
Vegetation	348	331	2.25	12.25	49.98	45.91
Rock	152	109	2.25	1.25	1.98	1.67
Pavement	185	250	0	2.00	1.36	1.81
Litter	398	375	71.25	60.25	55.00	46.81
Cryptogams	72	134	.50	.50	.77	6.75
Bare Ground	255	269	23.75	23.75	16.36	20.99

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 01, Anshutz Ranch

Effective rooting depth (in)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
13.9	63.3 (14.9)	7.6	40.7	26.0	33.3	2.9	5.9	83.2	.8



PELLET GROUP FREQUENCY --
Herd unit 06 , Study no: 1

Type	Quadrat Frequency		Pellet Transect	
			Pellet Groups per Acre	Days Use per Acre (ha)
	'96	'01	'01	'01
Rabbit	11	7	218	N/A
Horse	-	2	96	N/A
Grouse	-	1	9	N/A
Elk	8	7	618	48 (117)
Deer	6	2	44	3 (8)
Cattle	1	-	44	4 (9)

BROWSE CHARACTERISTICS --
Herd unit 06 , Study no: 1

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht.	Cr.	
Artemisia arbuscula																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	6	-	-	2	-	-	8	-	-	-	533			8
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	01	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	84	2	1	-	-	-	-	-	-	-	3	-	-	-	200			3
	90	9	-	-	4	-	-	-	-	-	13	-	-	-	866			13
	96	21	-	-	-	-	-	-	-	-	20	-	1	-	420			21
	01	10	-	-	-	-	-	-	-	-	10	-	-	-	200			10
M	84	8	47	1	-	-	-	-	-	-	56	-	-	-	3733	12	17	56
	90	41	1	-	3	-	-	-	-	-	45	-	-	-	3000	9	15	45
	96	280	46	3	-	-	-	-	-	-	322	3	4	-	6580	9	20	329
	01	276	87	-	-	-	-	-	-	-	361	2	-	-	7260	10	20	363
D	84	6	51	2	-	-	-	-	-	-	53	-	6	-	3933			59
	90	69	-	-	1	-	-	-	-	-	52	1	-	17	4666			70
	96	23	26	2	1	-	-	-	-	-	41	-	-	11	1040			52
	01	85	19	-	2	-	-	-	-	-	59	-	-	47	2120			106
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	340			17
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	240			12

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	84%	03%	05%	+ 8%
'90	.78%	00%	13%	- 6%
'96	18%	01%	04%	+16%
'01	22%	00%	10%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	7866	Dec:	50%
	'90	8532		55%
	'96	8040		13%
	'01	9580		22%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata tridentata																		
S	84	37	-	-	-	-	-	-	-	-	37	-	-	-	2466			37
	90	3	-	-	1	-	-	2	-	-	5	-	1	-	400			6
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	64	6	-	-	-	-	-	-	-	69	-	1	-	4666			70
	90	29	10	-	10	-	-	-	-	-	48	1	-	-	3266			49
	96	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
	01	7	-	-	-	-	-	-	-	-	7	-	-	-	140			7
M	84	11	20	2	-	-	-	-	-	-	33	-	-	-	2200	27	35	33
	90	16	2	2	1	-	-	-	-	-	20	1	-	-	1400	28	29	21
	96	35	39	4	-	-	-	-	-	-	68	1	9	-	1560	29	34	78
	01	88	6	-	-	-	-	-	-	-	94	-	-	-	1880	29	38	94
D	84	1	23	2	-	-	-	-	-	-	24	-	2	-	1733			26
	90	19	8	-	-	-	-	-	-	-	22	-	2	3	1800			27
	96	6	15	2	-	-	-	-	-	-	10	-	12	1	460			23
	01	51	4	-	-	-	-	-	-	-	49	-	-	6	1100			55
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	460			23
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	480			24

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	38%	03%	02%	-25%
'90	21%	02%	05%	-66%
'96	49%	05%	20%	+29%
'01	06%	00%	04%	

Total Plants/Acre (excluding Dead & Seedlings)				
'84	8599	Dec:		20%
'90	6466			28%
'96	2200			21%
'01	3120			35%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Ceratoides lanata																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66	7	3	1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	1	-	1	-	-	-	-	-	2	-	-	-	40	7	8	2
	01	4	2	-	-	-	-	-	-	-	6	-	-	-	120	6	9	6
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	1	-	-	-	-	-	-	-	-	-	-	1	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	00%	00%	00%	
'96	33%	00%	00%	+57%
'01	43%	00%	14%	

Total Plants/Acre (excluding Dead & Seedlings)				
'84	66	Dec:		0%
'90	0			0%
'96	60			0%
'01	140			14%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus viscidiflorus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
	01	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	20	-	-	5	-	-	2	-	-	26	-	1	-	1800			27
	96	92	-	-	5	-	-	-	-	-	96	-	1	-	1940			97
	01	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	84	115	-	-	-	-	-	-	-	-	115	-	-	-	7666	9	11	115
	90	64	4	-	8	-	-	3	-	-	68	-	11	-	5266	9	13	79
	96	286	4	-	16	-	-	-	-	-	306	-	-	-	6120	8	12	306
	01	328	-	-	6	-	-	4	-	-	334	4	-	-	6760	7	11	338
D	84	127	-	-	-	-	-	-	-	-	123	-	4	-	8466			127
	90	95	-	-	2	-	-	23	-	-	69	-	9	42	8000			120
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	01	26	-	-	-	-	-	-	-	-	22	-	-	4	520			26
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	02%	- 7%
'90	02%	00%	28%	-46%
'96	.98%	00%	.24%	- 9%
'01	00%	00%	01%	

Total Plants/Acre (excluding Dead & Seedlings)				
'84	16132	Dec:		52%
'90	15066			53%
'96	8100			0%
'01	7340			7%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	1	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	14	-	-	-	-	-	1	-	-	14	1	-	-	1000			15
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	123	-	-	-	-	-	-	-	-	123	-	-	-	8200	7	6	123
	90	99	-	-	-	-	-	1	-	-	93	6	1	-	6666	5	7	100
	96	41	-	-	-	-	-	-	-	-	41	-	-	-	820	5	6	41
	01	76	3	-	-	-	-	1	-	-	70	10	-	-	1600	6	11	80
D	84	12	-	-	-	-	-	-	-	-	12	-	-	-	800			12
	90	12	-	-	-	-	-	-	-	-	10	-	-	2	800			12
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	- 6%
'90	00%	00%	02%	-89%
'96	00%	00%	00%	+44%
'01	04%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	9000	Dec:	9%
	'90	8466		9%
	'96	900		0%
	'01	1620		0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Tetradymia canescens																		
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	1	-	-	-	-	-	3	-	-	-	60			3
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66	8	3	1
	90	-	1	-	-	-	-	-	-	-	1	-	-	-	66	4	5	1
	96	3	1	4	-	-	-	-	-	-	8	-	-	-	160	7	13	8
	01	6	-	-	-	-	-	-	-	-	6	-	-	-	120	6	12	6
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	01	3	-	-	-	-	-	-	-	-	2	-	-	1	60			3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	-50%
'90	100%	00%	00%	+73%
'96	08%	33%	00%	-25%
'01	00%	00%	11%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	132	Dec:	0%
	'90	66		0%
	'96	240		8%
	'01	180		33%

Trend Study 6-2-01

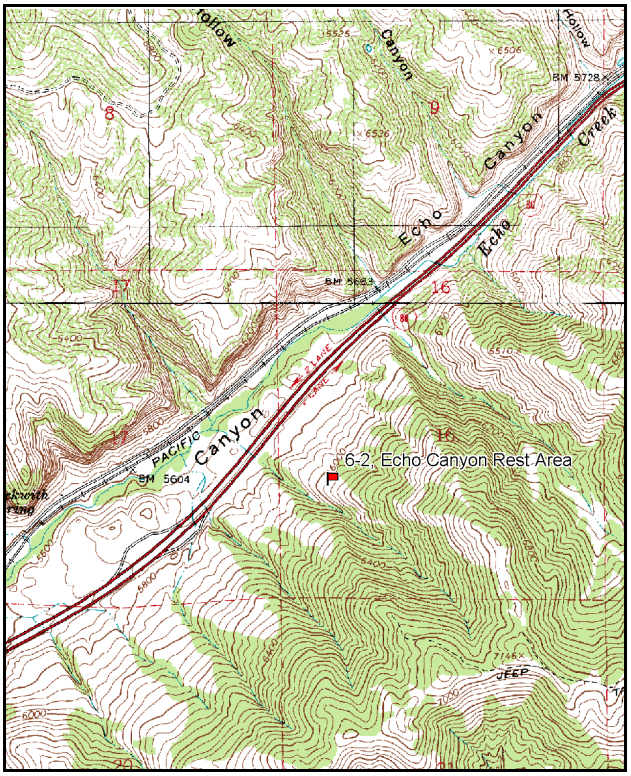
Study site name: Echo Canyon Rest Area . Vegetation type: Mountain Brush .

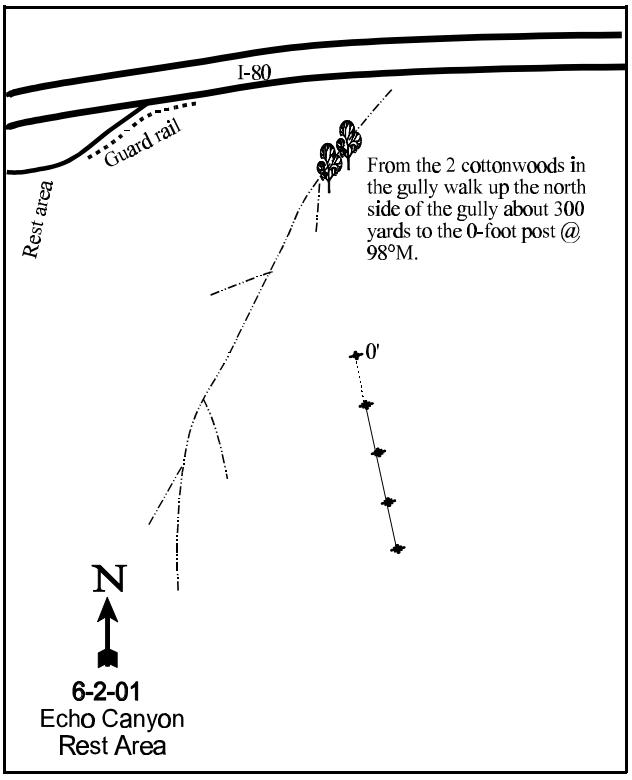
Compass bearing: frequency baseline 80 degrees magnetic.

Frequency belt placement: Line 1 (11 & 95ft), line 2 (59ft), line 3 (71ft), line 4 (34ft).

LOCATION DESCRIPTION

Beginning at Echo Reservoir, travel northeast on Highway I-80 to the rest area (approximately 2 miles). From the rest area, follow the guard-rail on the right side of the freeway until it ends (approximately 100 yards). From the end of the guard-rail, proceed on an azimuth of 90 degrees magnetic for approximately 305 paces to a point on the left-hand or north side of the canyon. The 0-foot stake of the baseline consists of a green steel fencepost, 12"-18" high, and is marked with browse tag #7950.





Map Name: Coalville

Diagrammatic Sketch

Township 3N , Range 5E , Section 16

UTM 4537730 N 466866 E

DISCUSSION

Trend Study 6-2

The Echo Canyon Rest Area study originally replaced a line intercept transect established in 1977. It was located slightly uphill from Line 2 of that study, which sampled similar plant communities where true mountain mahogany was prominent. However, this site had many problems. It had a very steep south slope (>80%), rock and pavement cover combined for more than 32%, and the site showed almost no big game use. Therefore, the study site was moved up onto a nearby ridge. The study now lies on a west aspect, a slope of about 32%, and an elevation of approximately 6,000 feet. In 1999, a burn went through the area covering most of the slope where this study lies, including the study site itself. In 1996 (pre-burn), pellet group quadrat frequency showed moderately high use for deer, light use for elk, and occasional use by moose. Pellet group quadrat frequency for deer decreased by 2/3 in 2001, and no elk or moose pellet groups were sampled in quadrats. A pellet group transect read along the baseline in 2001 estimated 26 deer days use/acre (64 ddu/ha) and 7 elk days use/acre (18 edu/ha).

Soil texture on the site is classified as a sandy clay loam. Soils are moderately deep with an effective rooting depth (see methods section) estimated at almost 15 inches. This is the second deepest effective rooting depth on any of the studies within the management unit. Surface rock and pavement are not particularly abundant, yet the soil profile is moderately stony throughout. Erosion is not excessive on this moderately steep ridge because of the well dispersed vegetation and litter cover, with a fairly low percentage of bare ground. An erosion condition class assessment showed slightly eroding soils in 2001.

This site contains a moderately diverse browse community, both before and after the burn. Prior to the fire, the key browse consisted mostly of mountain big sagebrush, true mountain mahogany, bitterbrush, and serviceberry. Two other species that are usually not considered key browse, snowberry and Gambel oakbrush, were also present and had displayed some use in past readings. Mountain big sagebrush was the most abundant browse in 1996, providing 44% of the browse cover and an estimated density of 2,440 plants/acre. The increase in density of mountain big sagebrush in 1996 is due to the relocation of the transect for a more favorable site. In 1996, most of the population was mature and decadent plants, with low recruitment at 5%. The one characteristic that should be noted is that percent decadence for sagebrush decreased from about 60% in 1984 and 1990, to 39% in 1996. Some of this decrease is likely due to relocation of the transect to an area that is more suitable for sagebrush. However, drought conditions in the past most likely played a role in such high percent decadence as well. A cause for concern in 1996 was the high proportion of decadent sagebrush classified as having poor vigor or dying (56%). Use on sagebrush in 1984 was mostly heavy, and in 1996 use was mostly light to moderate. The post-burn inventory conducted in 2001 estimated mountain big sagebrush density at only 80 young plants/acre. The fire nearly eliminated this species from the site.

When the site was monitored in 2001 following the fire, it was noted that some of the other key browse species were resprouting, primarily mountain mahogany and serviceberry. A lot of the mahogany and serviceberry were classified as decadent in 2001 after being burned. However, percent decadence may have been overestimated as many of the resprouting individuals could have been classified as young. True mountain mahogany density was estimated at 420 plants/acre in 1996 (pre-burn) and 300 plants/acre in 2001 (post-burn). Both of these estimates are much lower than the 1984 and 1990 readings, due mostly to site being relocated in 1996. Use on mahogany was light in 2001, but moderate to heavy in all other readings. Serviceberry has an estimated density of 200 plants/acre in 2001, an increase from the 120 plants/acre reported in 1996. Bitterbrush is infrequent with an average density of 50 plants/acre in 1996 and 2001.

Gambel oak and stickyleaf low rabbitbrush populations did not appear to be increasing in 1996. However, Gambel oak density increased from 760 stems/acre in 1996 to over 2,000 stems/acre in 2001. This species is a

vigorous sprouter following fire. Stickyleaf low rabbitbrush maintained a stable population between 1996 and 2001.

The herbaceous understory is important on this site as it provided 48% of the total vegetative cover in 1996, increasing to 77% in 2001 following the burn. A compositional change occurred between 1996 and 2001 due to the fire. In 1996, 88% of the herbaceous cover was made up of grasses. In 2001, grasses provided only 47% of the herbaceous cover, while forbs provided 53% of the cover. The increase in forbs was due primarily to two perennial species, yarrow and American vetch, as well as several annual species including pale alyssum, littleflower collinsia, holosteum, and bur buttercup. Sandberg bluegrass and bluebunch wheatgrass made up 85% of the grass cover in 1996. In 2001, both significantly decreased in nested frequency. Cheatgrass made up 14% of the grass cover in 1996, increasing to 34% in 2001. Cheatgrass increased in nested frequency in 2001, but not significantly. Annual forbs had a tenfold increase in sum of nested frequency in 2001. Annual species often increase following disturbance (fire in this case).

1996 APPARENT TREND ASSESSMENT

This site was moved a short distance to sample a more representative area in 1996. The previous two assessment year summaries for 1984 and 1990 have been deleted because they would have been counter intuitive to the trend that is occurring on the new site at this time.

The trend for soil would be considered stable because of the high amounts of vegetative cover (51%) and litter cover (56%), with percent bare ground at only 7%. The key browse species is mountain big sagebrush which contributes 44% of the browse cover. Percent decadence has decreased, but 56% of the decadent plants were classified as dying or with poor vigor. This could cause a continuing loss to the population, but does appear to have become more stable with increased precipitation. All the other key browse species have very low or no decadent plants. Gambel oak seems to be stable. Trend appears mixed with sagebrush being slightly down and the remainder of the browse being stable. The herbaceous understory appears stable, providing almost half of the total vegetative cover.

2001 TREND ASSESSMENT

Trend for soil is slightly down. With the burn between 1996 and 2001, litter cover decreased and percent bare ground increased. An erosion condition class assessment determined soils to be slightly eroding. Trend for browse is down due to the decline in sagebrush density, and increased decadence on several other browse species due to fire. Mountain big sagebrush density declined by 97% in 2001, with only 80 young plants/acre being sampled. Mountain big sagebrush provided 44% of the browse cover in 1996, decreasing to 0% in 2001. True mountain mahogany density decreased as well, but many of the plants are sprouting, and the population should improve in the future with recruitment of young plants being estimated at 13%. Serviceberry and bitterbrush were infrequent prior to the fire, and remain so afterward. Percent decadency on all 3 of these species increased in 2001. Gambel oak density increased from an estimated 760 stems/acre to over 2,000 stems/acre in 2001. This species is a vigorous sprouter following fire. The herbaceous understory has a stable trend. Sum of nested frequency for the two key perennial grasses, Sandberg bluegrass and bluebunch wheatgrass significantly decreased. However, sum of nested frequency for perennial forbs more than doubled. Overall trend is stable with the decrease in perennial grass frequency being offset by the increase in perennial forb frequency.

TREND ASSESSMENT
soil - slightly down (2)
browse - down (1)
herbaceous understory - stable (3)

HERBACEOUS TRENDS --
Herd unit 06 , Study no: 2

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'84	'90	'96	'01	'84	'90	'96	'01	'96	'01
G	Agropyron cristatum	-	2	-	-	-	1	-	-	-	-
G	Agropyron spicatum	a29	a22	c155	b96	14	15	60	41	6.88	6.83
G	Bromus carinatus	-	-	-	2	-	-	-	1	-	.15
G	Bromus tectorum (a)	-	-	142	189	-	-	44	66	3.30	7.93
G	Carex spp.	-	-	-	-	-	-	-	-	-	.00
G	Festuca myuros (a)	-	-	-	2	-	-	-	1	-	.00
G	Festuca ovina	-	-	4	-	-	-	1	-	.03	-
G	Koeleria cristata	-	-	3	1	-	-	1	1	.03	.00
G	Oryzopsis hymenoides	b84	b98	a-	a-	42	45	-	-	.00	-
G	Poa fendleriana	a-	a-	ab6	b14	-	-	3	6	.18	.57
G	Poa secunda	a-	a6	c270	b171	-	3	85	57	13.49	8.03
Total for Annual Grasses		0	0	142	191	0	0	44	67	3.30	7.94
Total for Perennial Grasses		113	128	438	284	56	64	150	106	20.62	15.60
Total for Grasses		113	128	580	475	56	64	194	173	23.93	23.54
F	Achillea millefolium	a-	a4	b105	c150	-	1	41	54	1.82	10.21
F	Agoseris glauca	-	-	-	2	-	-	-	1	-	.00
F	Alyssum alyssoides (a)	-	-	a23	b90	-	-	9	36	.11	3.04
F	Allium spp.	a-	a-	a4	b85	-	-	2	42	.03	.51
F	Ambrosia psilostachya	-	-	-	1	-	-	-	1	-	.15
F	Antennaria rosea	-	-	1	1	-	-	1	1	.03	.03
F	Arabis spp.	-	-	1	7	-	-	1	3	.00	.04
F	Artemisia ludoviciana	3	-	-	-	1	-	-	-	-	-
F	Astragalus beckwithii	a-	a-	a-	b12	-	-	-	5	-	.37
F	Astragalus convallarius	-	-	3	6	-	-	1	4	.03	.16
F	Aster spp.	-	-	3	-	-	-	2	-	.03	.03
F	Castilleja linariaefolia	-	-	3	1	-	-	1	1	.03	.03
F	Calochortus nuttallii	-	-	-	3	-	-	-	3	-	.01
F	Chaenactis douglasii	b15	c34	a-	a-	8	19	-	-	-	-
F	Cirsium undulatum	a11	a2	ab13	b33	6	2	8	16	.11	.79
F	Collomia linearis (a)	-	-	1	7	-	-	1	4	.00	.02
F	Comandra pallida	1	-	3	-	1	-	1	-	.00	-
F	Collinsia parviflora (a)	-	-	a12	b168	-	-	7	58	.03	3.34
F	Crepis acuminata	-	-	3	8	-	-	1	4	.00	.10
F	Descurainia pinnata (a)	-	-	a-	b37	-	-	-	17	-	.21

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'84	'90	'96	'01	'84	'90	'96	'01	'96	'01
F	Draba verna (a)	-	-	$_{a}$-	$_{b}$57	-	-	-	21	-	.20
F	Epilobium brachycarpum (a)	-	-	$_{a}$-	$_{b}$89	-	-	-	38	-	.46
F	Erigeron pumilus	$_{a}$-	$_{a}$-	$_{b}$26	$_{b}$24	-	-	12	10	.65	.32
F	Gayophytum ramosissimum (a)	-	-	3	3	-	-	1	1	.00	.00
F	Hackelia patens	-	-	3	-	-	-	2	-	.03	.15
F	Helianthella uniflora	-	-	-	-	-	-	-	-	-	.00
F	Holosteum umbellatum (a)	-	-	$_{a}$6	$_{b}$81	-	-	2	28	.01	1.18
F	Lactuca serriola	-	-	-	1	-	-	-	1	-	.00
F	Lomatium triternatum	-	-	-	4	-	-	-	3	-	.01
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{b}$14	-	-	-	6	-	.08
F	Oenothera caespitosa	$_{b}$14	$_{a}$-	$_{a}$-	$_{a}$-	6	-	-	-	-	-
F	Penstemon spp.	-	-	1	-	-	-	1	-	.00	-
F	Phlox longifolia	-	-	6	3	-	-	3	1	.02	.03
F	Polygonum douglasii (a)	-	-	6	2	-	-	3	1	.01	.00
F	Ranunculus testiculatus (a)	-	-	$_{a}$9	$_{b}$71	-	-	5	24	.02	1.31
F	Schoencrambe linifolia	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$20	-	-	-	8	-	.53
F	Senecio integerrimus	-	-	-	2	-	-	-	1	-	.00
F	Sisymbrium altissimum (a)	-	-	$_{a}$-	$_{b}$13	-	-	-	6	-	.22
F	Verbascum thapsus	$_{a}$2	$_{a}$-	$_{a}$-	$_{b}$16	2	-	-	7	-	.11
F	Vicia americana	-	-	$_{a}$35	$_{b}$120	-	-	16	43	.28	2.97
F	Zigadenus paniculatus	-	-	-	1	-	-	-	1	-	.03
Total for Annual Forbs		0	0	60	632	0	0	28	240	0.21	10.13
Total for Perennial Forbs		46	40	210	500	24	22	93	210	3.11	16.64
Total for Forbs		46	40	270	1132	24	22	121	450	3.33	26.77

Values with different subscript letters are significantly different at alpha = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 06 , Study no: 2

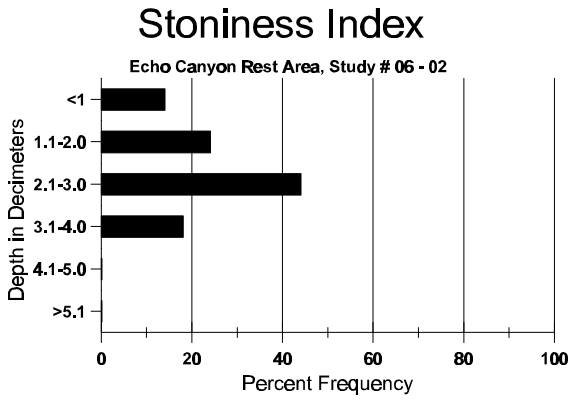
Type	Species	Strip Frequency '96	Strip Frequency '01	Average Cover % '96	Average Cover % '01
B	Amelanchier alnifolia	6	10	.07	.63
B	Artemisia tridentata vaseyana	75	3	12.75	-
B	Cercocarpus montanus	18	11	3.73	.97
B	Chrysothamnus nauseosus albicaulis	0	2	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	55	52	3.87	5.69
B	Gutierrezia sarothrae	4	3	.06	.18
B	Opuntia spp.	1	1	-	-
B	Purshia tridentata	2	2	1.00	1.25
B	Quercus gambelii	6	9	2.57	2.22
B	Symphoricarpos oreophilus	32	32	4.96	4.35
Total for Browse		199	125	29.04	15.31

BASIC COVER --
Herd unit 06 , Study no: 2

Cover Type	Nested Frequency '96	Nested Frequency '01	Average Cover % '84	Average Cover % '90	Average Cover % '96	Average Cover % '01
Vegetation	362	379	2.75	9.00	51.15	61.48
Rock	158	161	25.75	20.00	1.75	2.42
Pavement	172	260	18.25	12.50	2.69	3.64
Litter	397	352	35.50	38.50	55.56	36.42
Cryptogams	163	52	0	.25	6.57	1.93
Bare Ground	167	251	17.75	19.75	7.26	14.42

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 02, Echo Canyon Rest Area

Effective rooting depth (in)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
14.9	65.2 (19.7)	6.7	44.7	22.0	33.3	2.9	14.4	92.8	.4



PELLET GROUP FREQUENCY --
Herd unit 06 , Study no: 2

Type	Quadrat Frequency		Pellet Transect	
	'96	'01	Pellet Groups per Acre '01	Days Use per Acre (ha) '01
Rabbit	3	4	17	N/A
Moose	1	-	-	-
Elk	6	-	96	7 (18)
Deer	38	12	339	26 (64)

BROWSE CHARACTERISTICS --
Herd unit 06 , Study no: 2

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	1	-	-	-	-	1	-	-	-	66			1
	96	1	-	1	1	-	-	-	-	-	3	-	-	-	60			3
	01	3	1	-	-	-	-	-	-	-	4	-	-	-	80			4
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	1	-	-	-	1	-	-	2	-	-	-	133	31	29	2
	96	-	-	3	-	-	-	-	-	-	-	2	1	-	60	34	36	3
	01	3	-	-	-	-	-	-	-	-	3	-	-	-	60	24	31	3
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	2	-	-	-	-	-	1	-	-	3	-	-	-	60			3
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	33%	33%	00%	-40%
'96	00%	67%	17%	+40%
'01	10%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			Dec:	
	'84	0		0%
	'90	199		0%
	'96	120		0%
	'01	200		30%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	96	4	2	-	-	-	-	-	-	-	6	-	-	-	120			6
	01	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
M	84	-	1	3	-	-	-	-	-	-	4	-	-	-	266	32	43	4
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	5	44	19	-	-	-	-	-	-	50	-	18	-	1360	22	37	68
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0	21	35	0
D	84	-	1	6	-	-	-	-	-	-	4	-	2	1	466			7
	90	1	2	-	-	-	-	-	-	-	3	-	-	-	200			3
	96	7	28	13	-	-	-	-	-	-	21	-	23	4	960			48
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	740			37
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	860			43

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	17%	75%	25%	-58%
'90	40%	00%	00%	+86%
'96	61%	26%	37%	-97%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'84	798	Dec:		58%
'90	333			60%
'96	2440			39%
'01	80			0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Cercocarpus montanus																		
Y	84	-	40	-	-	-	-	-	-	-	40	-	-	-	2666			40
	90	-	-	4	3	-	-	-	-	-	2	5	-	-	466			7
	96	2	1	-	-	-	-	-	-	-	1	2	-	-	60			3
	01	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	84	-	2	98	-	-	-	-	-	-	100	-	-	-	6666	52	26	100
	90	-	-	11	-	1	-	-	-	-	9	3	-	-	800	36	23	12
	96	-	10	7	1	-	-	-	-	-	5	13	-	-	360	49	47	18
	01	5	-	-	-	-	-	-	-	-	5	-	-	-	100	25	31	5
D	84	-	-	4	-	-	-	-	-	-	4	-	-	-	266			4
	90	-	-	4	-	-	-	-	-	-	1	2	-	1	266			4
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	8	-	-	-	-	-	-	-	-	8	-	-	-	160			8
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	29%	71%	00%	-84%
'90	04%	83%	04%	-73%
'96	52%	33%	00%	-29%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	9598	Dec:	3%
	'90	1532		17%
	'96	420		0%
	'01	300		53%

Chrysothamnus nauseosus albicaulis																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	00%	00%	00%	
'96	00%	00%	00%	
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	0	Dec:	-
	'90	0		-
	'96	0		-
	'01	40		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus viscidiflorus																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
	01	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
M	84	5	-	-	-	-	-	-	-	-	5	-	-	-	333	20	28	5
	90	4	-	-	-	-	-	-	-	-	1	-	3	-	266	14	19	4
	96	105	-	-	8	-	-	-	-	-	110	-	3	-	2260	15	21	113
	01	107	-	-	-	-	-	-	-	-	104	3	-	-	2140	14	22	107
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	3	-	-	-	-	-	-	-	-	1	-	2	-	60			3
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	-20%
'90	00%	00%	75%	+89%
'96	00%	00%	04%	- 3%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	333	Dec:	0%
	'90	266		0%
	'96	2400		3%
	'01	2320		0%

Gutierrezia sarothrae																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	133	6	7	2
	96	6	-	-	-	-	-	-	-	-	6	-	-	-	120	7	8	6
	01	3	-	-	-	-	-	-	-	-	3	-	-	-	60	8	16	3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	00%	00%	00%	-55%
'96	00%	00%	00%	-33%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	0	Dec:	-
	'90	266		-
	'96	120		-
	'01	80		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40	6	26	2
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20	4	9	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	00%	00%	00%	
'96	00%	00%	00%	-50%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	0	Dec:	-
	'90	0		-
	'96	40		-
	'01	20		-

Purshia tridentata																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	1	2	-	-	-	-	-	3	-	-	-	60	34	64	3
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20	12	37	1
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	00%	00%	00%	
'96	00%	33%	00%	-33%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	0	Dec:	0%
	'90	0		0%
	'96	60		0%
	'01	40		50%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Quercus gambelii																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	15	34	-	-	-	-	-	-	-	49	-	-	-	3266			49
	90	9	6	-	3	-	-	1	-	-	13	6	-	-	1266			19
	96	23	-	-	-	-	-	-	-	-	23	-	-	-	460			23
	01	102	-	-	-	-	-	-	-	-	102	-	-	-	2040			102
M	84	-	4	5	-	-	-	-	-	-	9	-	-	-	600	68	48	9
	90	7	-	-	4	-	-	3	-	-	14	-	-	-	933	40	23	14
	96	10	3	-	-	-	-	-	-	-	10	3	-	-	260	16	29	13
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0	33	18	0
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	2	2	-	-	1	-	-	-	-	3	2	-	-	333			5
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	120			6

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	66%	09%	00%	-35%
'90	24%	00%	00%	-70%
'96	08%	00%	00%	+63%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	3866	Dec:	0%
	'90	2532		13%
	'96	760		5%
	'01	2040		0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Symphoricarpos oreophilus																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	11	5	-	1	-	-	-	-	-	17	-	-	-	340			17
	01	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	16	17	7	6	-	-	-	-	-	42	2	-	2	920	22	43	46
	01	29	-	-	1	-	-	-	-	-	30	-	-	-	600	20	47	30
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	1	-	-	-	-	-	-	-	-	1	-	20			1
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	00%	00%	00%	
'96	34%	13%	05%	-47%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	0	Dec:	0%
	'90	0		0%
	'96	1280		2%
	'01	680		3%

Trend Study 6-3-01

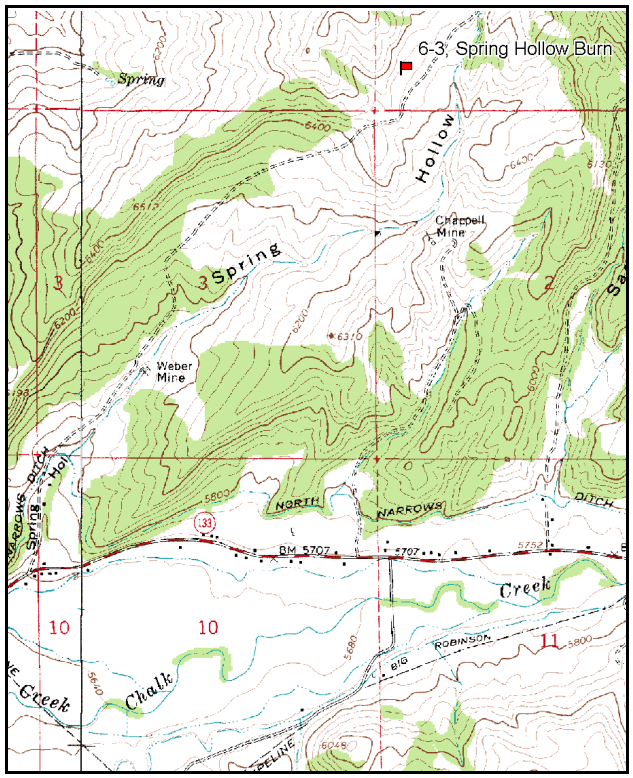
Study site name: Spring Hollow Burn . Vegetation type: Big Sagebrush-Grass .

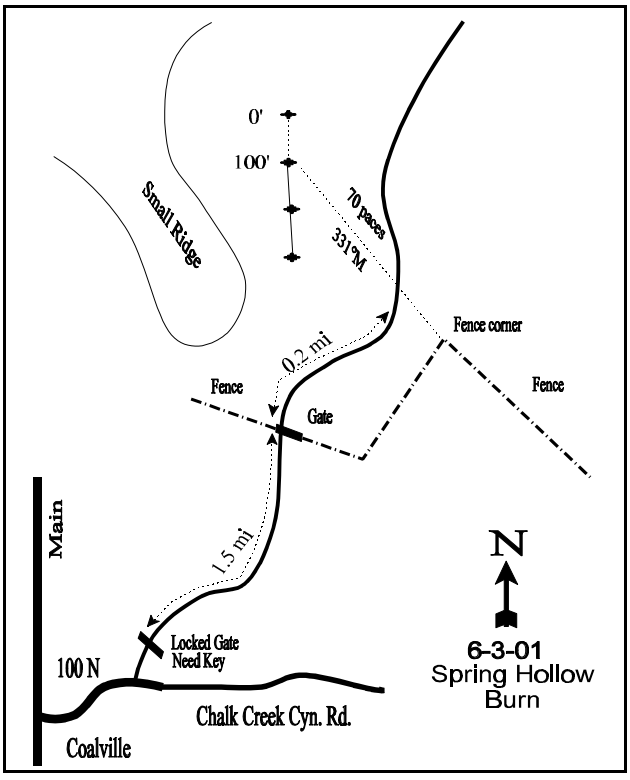
Compass bearing: frequency baseline 165 degrees magnetic.

Frequency belt placement: Line 1 (11 & 95ft), line 2 (34 & 71ft), line 3 (59ft).

LOCATION DESCRIPTION

From 100 North and Main in Coalville, travel east 1.3 miles to Spring Hollow Road. Turn left (northeast) and proceed 0.2 mile to a locked gate. Proceed through gate, and continue 1.5 miles to a gate. Continue 0.2 miles to a fence line corner on the right. From corner post, walk 70 paces at 331 degrees magnetic to the 100-foot stake of the baseline. The 0-foot stake is marked by browse tag #7974.





Map Name: Turner Hollow

Diagrammatic Sketch

Township 3N , Range 5E , Section 35

UTM 4532493 N 469930 E

DISCUSSION

Trend Study No. 6-3

The Spring Hollow Burn study is located on an old burn in the upper part of Spring Hollow, which was placed near a old line intercept study. This site was not read in 1996 because the landowner would not give us permission to go onto the property. However, permission was obtained to monitor the study in 2001. The area is deer winter range originally dominated by sagebrush-grass and juniper-pinyon communities. The area was subsequently seeded with perennial grasses, mostly crested and intermediate wheatgrass after the burn. The transect is located on a gently rolling, southeast-facing exposure at an elevation of 5,560 feet. This area is privately-owned and grazed by a variety of domestic animals in addition to winter use by deer and elk. During heavy winters this site may not be as critical for wildlife due to the lack of browse. In 1984, deer pellet groups occurred frequently, and 3 deer and 1 elk antler shed were found. In 2001, a pellet group transect read along the study baseline estimated 9 elk days use/acre (21 edu/ha), 6 deer days use/acre (15 ddu/ha), and 21 cow days use/acre (52 cdu/ha). Livestock were also observed near the site in 2001 when the study was monitored.

Soils are clay loam in texture, with a soil reaction that is slightly acidic (6.5 pH). Soil depth is quite shallow with an estimated effective rooting depth of less than 9 inches. The majority of the rock occurs in the upper portions of the profile. Organic matter is relatively high at 4.6%. Erosion is minimal due to the abundance of herbaceous vegetation cover, litter cover, and low percent bare ground. An erosion condition class assessment determined soils as stable in 2001.

Browse is very limited on the site providing only 2% average cover in 2001. Mountain big sagebrush and serviceberry are the most preferred species on the site. Both have densities estimated at 40 plants/acre or less. Both species show moderate to heavy use in 2001. Snakeweed is the most abundant species having an estimated density of 4,100 plants/acre in 2001. The sagebrush and serviceberry populations will remain minimal at this site due to high competition with crested wheatgrass for resources.

The herbaceous understory is dominated by crested wheatgrass, with Sandberg bluegrass being fairly abundant as well. Crested wheatgrass displayed moderate to heavy utilization over the entire site in 2001. It was reported in 1990 that grasses appeared less vigorous than at the line intercept study because of grazing effects and damage by ants and aphids. Forbs provided 15% of the vegetative cover on the site in 2001. Perennial species increased in sum of nested frequency between 1990 and 2001. Annuals, which were not sampled in 1984 or 1990, were also quite abundant in 2001.

1984 APPARENT TREND ASSESSMENT

Based on a rereading of the line intercept study, cover data from the 1984 study, and on-site reconnaissance, soil trend appears to be slowly improving and in fair condition. Vegetative trend is more difficult to assess. Although long-term trend may be toward an improving big sagebrush stand, it will likely be a very slow process. In the interim, the area will continue to be grass dominated and subject to sharp increases of undesirable shrubs in an irregular pattern.

1990 TREND ASSESSMENT

There is a significant increase in percent decadence in this low density, heavily used big sagebrush population. Also, the high density of snakeweed indicates a definite downward trend on this winter range. The site has an incredible infestation of ants and aphids on the sagebrush. In spite of these factors, the sagebrush display fair growth and seed production. No seedlings were found. Any openings in the dense crested wheatgrass stand that would allow young sagebrush to become established are crowded with snakeweed seedling and young. The dense stand of small crested wheatgrass plants had increased nested frequency values. It shows 40-60% utilization, and cattle are still in the area utilizing the fall green-up. Litter cover is fair. The percentage of cryptogamic cover decreased from 11 to 2%. There is evidence of some soil erosion.

TREND ASSESSMENT
soil - down (1)
browse - down (1)
herbaceous understory - stable (3)

2001 TREND ASSESSMENT

Trend for soil is stable. Soils have minimal erosion, vegetation and litter cover are well disbursed, and bare soil is moderately low. Trend for browse is stable, although browse is limited on the site with only 20 sagebrush and 40 serviceberry plants/acre being estimated in 2001. Due to the lack of dead sagebrush plants, the large decrease in sagebrush density since 1990 is due to the greatly increased sample size used in 2001 which more accurately estimates browse populations that have clumped and/or discontinuous distributions. Sagebrush is very patchy throughout the entire area. Recruitment by residual plants seems unlikely in the future due to competition with understory of crested wheatgrass. Snakeweed has a much lower density compared to 1984 and 1990 estimates. The population appears stable with an age class consisting of 94% mature plants. Trend for the herbaceous understory is slightly up due an increase in sum of nested frequency for perennial grasses and forbs.

TREND ASSESSMENT
soil - stable (3)
browse - stable but limited (3)
herbaceous understory - slightly up (4)

HERBACEOUS TRENDS --
Herd unit 06 , Study no: 3

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %
		'84	'90	'01	'84	'90	'01	'01
G	Agropyron cristatum	a312	b348	b323	96	100	92	27.98
G	Agropyron dasystachyum	a10	a-	ab11	4	-	5	.67
G	Agropyron intermedium	a-	b9	ab5	-	5	3	.04
G	Agropyron spicatum	a5	a7	b46	4	3	16	2.08
G	Elymus cinereus	-	-	3	-	-	1	.03
G	Koeleria cristata	a14	a2	b44	7	1	18	.59
G	Poa bulbosa	-	-	9	-	-	4	.12
G	Poa fendleriana	-	5	-	-	2	-	-
G	Poa pratensis	1	-	8	1	-	4	.07
G	Poa secunda	a77	b214	b205	36	74	73	4.55
G	Stipa spp.	-	3	-	-	1	-	-
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		419	588	654	148	186	216	36.16
Total for Grasses		419	588	654	148	186	216	36.16
F	Achillea millefolium	a3	a4	b20	1	2	8	.11
F	Agoseris glauca	a-	a-	b12	-	-	7	.04
F	Alyssum alyssoides (a)	-	-	42	-	-	20	.25
F	Allium spp.	a-	a-	b54	-	-	27	.18
F	Antennaria rosea	-	-	2	-	-	1	.03
F	Arabis spp.	-	4	-	-	2	-	-
F	Artemisia ludoviciana	4	8	8	1	3	3	.06
F	Aster chilensis	a7	a8	b60	3	3	20	1.82
F	Astragalus convallarius	-	-	2	-	-	1	.03
F	Astragalus spp.	a-	a-	b59	-	-	28	.39
F	Calochortus nuttallii	-	-	3	-	-	3	.01
F	Cirsium undulatum	5	3	4	4	1	3	.06
F	Collomia linearis (a)	-	-	34	-	-	16	.08
F	Collinsia parviflora (a)	-	-	98	-	-	38	.33
F	Descurainia pinnata (a)	-	-	6	-	-	2	.01
F	Draba spp. (a)	-	-	85	-	-	31	.18
F	Epilobium brachycarpum (a)	-	-	85	-	-	33	.46
F	Erodium cicutarium (a)	-	-	3	-	-	2	.01
F	Erigeron divergens	b124	a56	a46	48	25	22	.65
F	Holosteum umbellatum (a)	-	-	31	-	-	13	.09

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %
		'84	'90	'01	'84	'90	'01	'01
F	Lappula occidentalis (a)	-	-	9	-	-	4	.04
F	Lactuca serriola	-	-	8	-	-	3	.04
F	Lithospermum ruderale	$_{b}$45	$_{b}$42	$_{a}$8	22	20	4	.49
F	Lupinus argenteus	-	-	2	-	-	2	.06
F	Microsteris gracilis (a)	-	-	27	-	-	14	.11
F	Oenothera pallida	$_{b}$40	$_{b}$32	$_{a}$14	16	16	8	.23
F	Phlox longifolia	-	-	7	-	-	3	.01
F	Polygonum douglasii (a)	-	-	34	-	-	14	.07
F	Ranunculus testiculatus (a)	-	-	46	-	-	20	.15
F	Senecio integerrimus	-	-	2	-	-	2	.01
F	Sphaeralcea coccinea	-	4	4	-	2	3	.02
F	Tragopogon dubius	$_{a}$8	$_{a}$12	$_{b}$56	4	9	29	.42
F	Viguiera multiflora	-	1	-	-	1	-	-
F	Zigadenus paniculatus	$_{a}$-	$_{a}$-	$_{b}$13	-	-	7	.19
Total for Annual Forbs		0	0	500	0	0	207	1.80
Total for Perennial Forbs		236	174	384	99	84	184	4.89
Total for Forbs		236	174	884	99	84	391	6.70

Values with different subscript letters are significantly different at alpha = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 06 , Study no: 3

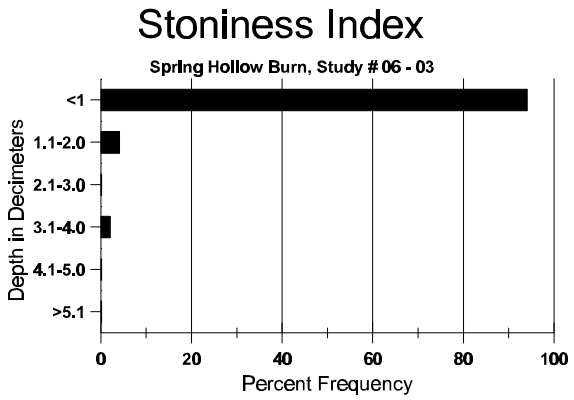
Type	Species	Strip Frequency '01	Average Cover % '01
B	Amelanchier alnifolia	2	.03
B	Artemisia tridentata vaseyana	1	.63
B	Chrysothamnus viscidiflorus viscidiflorus	8	.18
B	Gutierrezia sarothrae	63	1.19
B	Leptodactylon pungens	1	-
B	Opuntia spp.	3	-
B	Symphoricarpos oreophilus	1	-
Total for Browse		79	2.03

BASIC COVER --
Herd unit 06 , Study no: 3

Cover Type	Nested Frequency '01	Average Cover % '84	'90	'01
Vegetation	379	3.50	15.50	49.49
Rock	202	7.00	3.25	3.73
Pavement	317	11.50	15.75	6.90
Litter	372	49.50	43.25	43.11
Cryptogams	12	11.25	2.00	.07
Bare Ground	280	17.25	20.25	13.19

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 03, Spring Hollow Burn

Effective rooting depth (in)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
8.6	66.0 (12.0)	6.5	30.9	38.4	30.6	4.6	25.8	384.0	.9



PELLET GROUP FREQUENCY --
Herd unit 06 , Study no: 3

Type	Quadrat Frequency '01	Pellet Transect Pellet Groups per Acre ⁞01	Pellet Transect Days Use per Acre (ha) ⁞01
Rabbit	10	9	N/A
Horse	1	-	-
Elk	5	113	9 (21)
Deer	2	78	6 (15)
Cattle	16	252	21 (52)

BROWSE CHARACTERISTICS --
Herd unit 06 , Study no: 3

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0	21	23	0
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	1	1	-	-	-	-	-	-	2	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	00%	00%	00%	
'01	50%	50%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'84	0	Dec:		0%
'90	0			0%
'01	40			100%

Artemisia tridentata vaseyana																		
S	84	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	15	6	-	-	-	-	-	-	21	-	-	-	700	17	23	21
	90	-	7	4	-	-	-	-	-	-	-	11	-	-	366	23	36	11
	01	-	1	-	-	-	-	-	-	-	1	-	-	-	20	22	34	1
D	84	-	2	4	-	-	-	-	-	-	4	2	-	-	200			6
	90	-	6	4	-	-	-	-	-	-	1	8	1	-	333			10
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	59%	34%	00%	-28%
'90	62%	38%	05%	-97%
'01	100%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'84	966	Dec:		21%
'90	699			48%
'01	20			0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus viscidiflorus																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	3	-	-	-	-	-	3	-	-	-	100			3
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	1	-	-	-	-	-	-	-	-	1	-	-	-	33	11	17	1
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33	12	11	1
	01	16	-	-	-	-	-	-	-	-	16	-	-	-	320	9	13	16
D	84	1	-	-	-	-	-	-	-	-	-	-	1	-	33			1
	90	4	1	-	1	-	-	-	-	-	4	-	-	2	200			6
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	50%	+80%
'90	10%	00%	20%	- 4%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'84	66	Dec:		50%
'90	333			60%
'01	320			0%

Gutierrezia sarothrae																		
S	84	43	-	-	-	-	-	-	-	-	43	-	-	-	1433			43
	90	29	-	-	-	-	-	-	-	-	29	-	-	-	966			29
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	124	-	-	-	-	-	-	-	-	124	-	-	-	4133			124
	90	239	1	-	-	-	-	-	-	-	232	7	1	-	8000			240
	01	11	-	-	-	-	-	-	-	-	11	-	-	-	220			11
M	84	486	-	-	-	-	-	-	-	-	486	-	-	-	16200	7	6	486
	90	242	2	-	-	-	-	-	-	-	243	-	1	-	8133	7	7	244
	01	193	-	-	-	-	-	-	-	-	191	2	-	-	3860	7	8	193
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	25	1	-	-	-	-	-	-	-	15	-	7	4	866			26
	01	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	-16%
'90	.78%	00%	03%	-76%
'01	00%	00%	.48%	

Total Plants/Acre (excluding Dead & Seedlings)			
'84	20333	Dec:	0%
'90	16999		5%
'01	4100		0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Leptodactylon pungens																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	01	3	-	-	-	-	-	-	-	-	3	-	-	-	60	-	-	3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	00%	00%	00%	
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	0	Dec:	-
	'90	0		-
	'01	60		-

Opuntia spp.																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	90	6	-	-	-	-	-	-	-	-	6	-	-	-	200			6
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	11	-	-	-	-	-	-	-	-	11	-	-	-	366	3	3	11
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	66	5	10	2
	01	3	-	-	-	-	-	-	-	-	3	-	-	-	60	4	9	3
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	-	-	1	-	33			1
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	-25%
'90	00%	00%	11%	-80%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	399	Dec:	0%
	'90	299		11%
	'01	60		0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Symphoricarpos oreophilus																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20	15	23	1
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	00%	00%	00%	-39%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	0	Dec:	0%
	'90	33		100%
	'01	20		0%

Trend Study 6-4-01

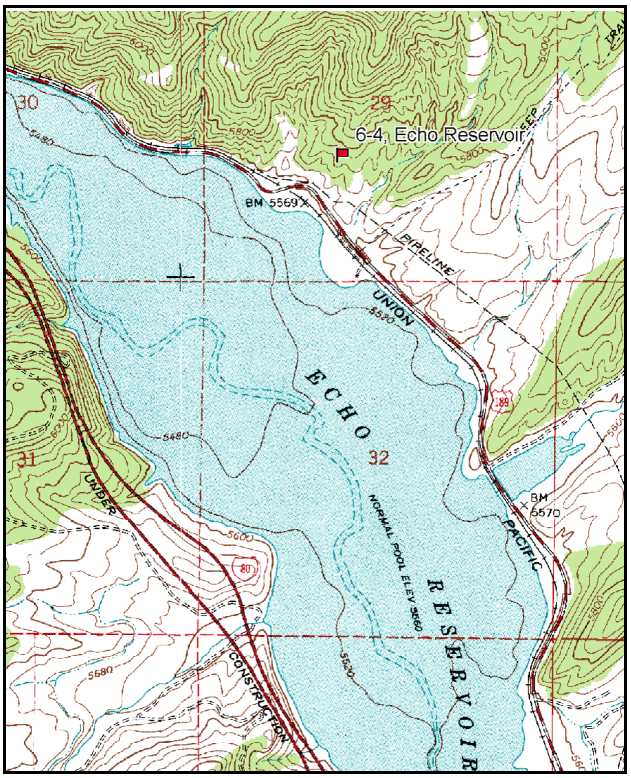
Study site name: Echo Reservoir . Vegetation type: Juniper .

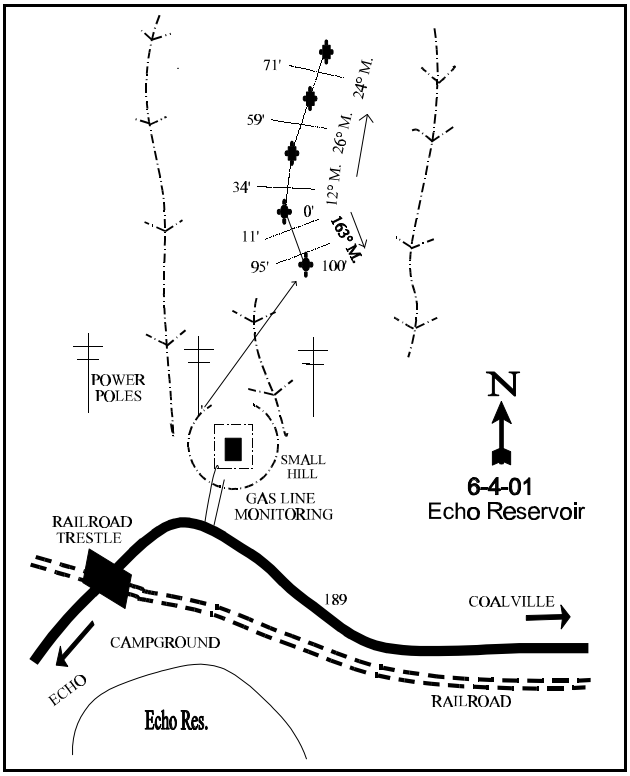
Compass bearing: frequency baseline 163 degrees magnetic.

Frequency belt placement: Line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the east end of Echo Dam, proceed toward Coalville on Highway 189 to a point where the road passes over railroad tracks. Continue for approximately 150 yards to a spur road on the left that leads to a gas monitoring station on a small hill. From the power pole, approximately 25 yards north of the station, walk up the narrow ridge north of the power pole approximately 70 paces at 45 degrees true to the 100-foot stake of the baseline. The 0-foot stake is marked by browse tag #7970. The rest of the baseline runs off the 0-foot baseline stake. Line 2 runs in a direction of 34 degrees magnetic. Line 3 runs in a direction of 26 degrees magnetic. Line 4 runs in a direction of 24 degrees magnetic.





Map Name: Coalville

Diagrammatic Sketch

Township 3N , Range 5E , Section 29

UTM 4534516 N 465647 E

DISCUSSION

Trend Study No. 6-4

The Echo Reservoir study samples a Utah juniper community located immediately east of Echo Reservoir near Coalville. This area has critical importance to wintering deer, and to a lesser extent elk. Topographically, the study area is on a rugged southwest-facing slope that becomes very steep on the north and east, but is more gentle near the reservoir. Elevation of the study is about 5,600 feet. Much of the surrounding area, including the high ridge to the north and the bench lands lying immediately adjacent to Grass Creek, were consumed by fire prior to 1977. The old line intercept transect, as well as the range trend study, both lie entirely within unburned juniper.

Big game use of this study area can generally be classified as moderate to heavy. Deer use was known to be heavy prior to 1977 and has, if anything, increased in the intervening years. Although deer were fed at two nearby locations during the winter of 1983-84, signs of long-term winter use was intense. The result of heavy use has been the elimination of nearly all the browse forage, which was already in low abundance. The only species currently capable of providing more than token amounts of browse forage is Utah juniper. Even this species was intensely "highlined" in the past, and provides only limited forage. Further evidence of heavy deer use is provided by the more than 50 winter-killed carcasses from the critical winter of 1983-84 being observed along the old line intercept transect. A pellet group transect read on the site in 2001 estimated 63 deer days use/acre (155 ddu/ha), 8 elk days use/acre (20 edu/ha), and 4 cow days use/acre (9 cdu/ha). In 2001, 3 deer carcasses were also observed on the site.

Soil is a coarse textured, cobblestone loam derived from conglomerate parent material. Effective rooting depth was estimated at just over 12 inches. The soil is clay loam in texture with a moderately alkaline soil reaction (7.9 pH). One characteristic that is of concern is the high average soil temperature on the site determined to be nearly 76°F in 1996. This high of a soil temperature helps explain the presence of cheatgrass, a winter annual, on the site. High soil temperatures are often indicative that a site is prone to invasion by annual species. On the more gentle slopes, soil depth is moderate. On the steeper slopes, soil depth is more shallow and the erosion rate is more rapid. Bare soil has ranged from 23% in 1996 to 32% in 1990. Most of the bare soil lies in the interspaces between juniper trees. On more gentle areas, there is good litter cover under tree crowns and fair grass cover within the tree interspaces. Apart from some unpalatable increasers, shrubs provide very little cover or forage. An erosion condition class assessment done in 2001 determined soil erosion as moderate.

Browse composition consists of a variety of shrubs, of which only mountain big sagebrush and Saskatoon serviceberry are palatable. The remaining species are less preferred and generally classed as increasers or invaders. Most abundant are stickyleaf low rabbitbrush and broom snakeweed. Big sagebrush and serviceberry occurred at very low densities in the past, with an understandably high incidence of decadence. In 2001, no live plants of either species were sampled on the site. Utah juniper is highlined, but not like it was in the winters of 1982-84. It has shown significant recovery, yet is still a limited source of low quality browse. Point-centered quarter data taken in 2001 estimated 80 juniper trees/acre.

Considering the dominant species on the site is juniper, grasses are moderately abundant. Cheatgrass brome was the dominant grass in 1996, providing 64% of the grass cover and 38% of the total vegetative cover on the site. Cheatgrass significantly declined in nested frequency and cover in 2001 due to the drought conditions of 2000 and 2001 in Northern Utah. Perennial grasses nearly doubled in cover in 2001. Indian ricegrass, Sandberg bluegrass, and needle-and-thread all significantly increased in nested frequency in 2001, while bluebunch wheatgrass significantly decreased in nested frequency. Overall, perennial grass sum of nested frequency values increased between 1996 and 2001. Perennial grasses were large and vigorous in

2001. They were also noted as producing plenty of seed. Forbs have been relatively insignificant during all years it has been sampled, contributing only 2% average cover in 2001.

1984 APPARENT TREND ASSESSMENT

Although this area is characterized by heavy sheet and gully erosion, there is some evidence of improvement since 1977. The increase in grass density and vigor, especially that of perennial grasses, suggests a slight improvement in soil trend. In contrast, there has been a new low in shrub cover. Overall trend is only marginally better. Vegetative trend appears to be going downward because of the obvious decline or disappearance of valuable browse species, severe highlining of Utah juniper, and an apparent increase among less palatable increaser shrubs.

1990 TREND ASSESSMENT

The downward browse trend assessed in 1984 for this heavily used winter range still applies. The estimated 101 juniper trees/acre are mostly mature, severely highlined trees. Low rabbitbrush provides most of the browse forage. Opuntia and broom snakeweed are the only browse species that increased in density. The perennial grass component has improved since 1984. The site has a good stand of bluebunch wheatgrass, which increased significantly in frequency, plus Indian ricegrass and needle-and-thread. However, the percentage of litter cover declined, which would be expected with the extended drought. Bare areas increased which could cause more sheet and gully erosion on the steeper slopes.

TREND ASSESSMENT
soil - slightly downward (2)
browse - down (1)
herbaceous understory - slightly up with increases in perennial grasses (4)

1996 TREND ASSESSMENT

Percent bare ground has decreased from 32% to 23%. The nested frequency ratio of bare ground to protective cover (vegetation, litter, and cryptogams) is good at over 1:3. Soil trend is considered slightly up. The browse trend is continuing downward with most all of the preferred key browse species dying off. The trend for the herbaceous understory is slightly down, especially for perennial grasses. Sum of nested frequency for perennial grasses decreased by 16% between 1990 and 1996. Cheatgrass currently contributes 64% of the grass cover, which makes the site a hazard for destructive wildfires.

TREND ASSESSMENT
soil - improved, still only fair (4)
browse - continuing downward, loss of almost all preferred browse species (1)
herbaceous understory - slightly down due to decreased frequency of perennial grasses (2)

2001 TREND ASSESSMENT

Trend for soil is stable. Bare soil slightly increased, but the nested frequency ratio of bare soil to protective cover (vegetation, litter, and cryptogams) only slightly declined, and is still good at over 1:3. Trend for browse remains down. Palatable browse is in very low abundance. Juniper is the dominant browse. The less palatable species, low rabbitbrush, prickly pear, and snakeweed, are the most abundant shrubs. Trend for the herbaceous understory is slightly up. Perennial grasses increased in sum of nested frequency, and cheatgrass brome has greatly reduced cover and frequency due to drought.

TREND ASSESSMENT
soil - stable (3)
browse - down (1)
herbaceous understory - slightly up (4)

HERBACEOUS TRENDS --
Herd unit 06 , Study no: 4

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'84	'90	'96	'01	'84	'90	'96	'01	'96	'01
G	Agropyron dasystachyum	ab13	b21	ab7	a6	6	9	3	2	.18	.15
G	Agropyron spicatum	a81	b130	c177	ab109	31	51	63	44	5.22	4.59
G	Bromus brizaeformis (a)	-	-	7	-	-	-	4	-	.02	-
G	Bromus japonicus (a)	-	-	-	2	-	-	-	1	-	.00
G	Bromus tectorum (a)	-	-	b323	a152	-	-	93	62	15.37	1.27
G	Oryzopsis hymenoides	b71	b79	a26	b70	31	38	13	36	.43	3.11
G	Poa fendleriana	a-	a-	b18	a-	-	-	6	-	.13	-
G	Poa pratensis	-	-	2	5	-	-	1	2	.00	.30
G	Poa secunda	a10	c143	b63	c150	5	52	24	59	.93	2.65
G	Sitanion hystrix	-	-	1	3	-	-	1	1	.03	.00
G	Sporobolus cryptandrus	2	1	-	-	1	1	-	-	-	-
G	Stipa comata	a32	a47	a61	b92	16	25	26	38	1.87	5.07
Total for Annual Grasses		0	0	330	154	0	0	97	63	15.39	1.28
Total for Perennial Grasses		209	421	355	435	90	176	137	182	8.81	15.89
Total for Grasses		209	421	685	589	90	176	234	245	24.20	17.17
F	Agoseris glauca	-	1	-	-	-	1	-	-	-	-
F	Alyssum alyssoides (a)	-	-	b291	a264	-	-	90	89	2.98	1.28
F	Allium spp.	-	-	-	4	-	-	-	2	-	.01
F	Antennaria rosea	b24	b20	a-	a3	10	8	-	1	-	.00
F	Astragalus spp.	-	-	-	3	-	-	-	1	-	.00
F	Astragalus utahensis	b79	a17	b68	a38	34	10	31	18	1.45	.29
F	Camelina microcarpa (a)	-	-	-	1	-	-	-	1	-	.00
F	Calochortus nuttallii	-	-	-	10	-	-	-	3	-	.01
F	Cirsium undulatum	8	2	3	-	4	2	2	-	.03	-
F	Collomia linearis (a)	-	-	-	3	-	-	-	1	-	.00
F	Collinsia parviflora (a)	-	-	-	8	-	-	-	4	-	.04
F	Cordylanthus ramosus (a)	-	-	-	1	-	-	-	1	-	.00
F	Crepis acuminata	-	-	1	-	-	-	1	-	.00	-
F	Cryptantha spp.	-	-	10	-	-	-	3	-	.06	-
F	Cymopterus spp.	-	-	2	6	-	-	2	2	.01	.01
F	Descurainia pinnata (a)	-	-	-	1	-	-	-	1	-	.00

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'84	'90	'96	'01	'84	'90	'96	'01	'96	'01
F	Draba spp. (a)	-	-	-	2	-	-	-	1	-	.00
F	Epilobium brachycarpum (a)	-	-	-	4	-	-	-	2	-	.03
F	Eriogonum brevicaule	6	2	5	-	2	2	4	-	.09	-
F	Erigeron pumilus	$_{a}$-	$_{ab}$5	$_{a}$-	$_{b}$12	-	2	-	6	-	.08
F	Galium aparine (a)	-	-	-	2	-	-	-	1	-	.00
F	Hackelia patens	-	-	4	-	-	-	3	-	.01	-
F	Holosteum umbellatum (a)	-	-	1	6	-	-	1	4	.00	.02
F	Lesquerella spp.	-	-	-	3	-	-	-	1	-	.00
F	Lomatium spp.	-	-	-	3	-	-	-	2	-	.01
F	Machaeranthera grindelioides	-	-	-	5	-	-	-	2	-	.03
F	Penstemon humilis	1	-	-	-	1	-	-	-	-	-
F	Phlox austromontana	22	21	12	8	11	9	5	5	.12	.19
F	Phlox longifolia	-	1	-	-	-	1	-	-	-	-
F	Ranunculus testiculatus (a)	-	-	-	5	-	-	-	3	-	.01
F	Sphaeralcea coccinea	30	29	24	19	12	13	11	9	.49	.31
F	Townsendia spp.	-	-	-	5	-	-	-	2	-	.01
F	Tragopogon dubius	$_{b}$15	$_{a}$1	$_{a}$1	$_{a}$-	8	1	1	-	.00	-
F	Vicia americana	-	-	-	3	-	-	-	2	-	.01
Total for Annual Forbs		0	0	292	297	0	0	91	108	2.98	1.43
Total for Perennial Forbs		185	99	130	122	82	49	63	56	2.30	1.00
Total for Forbs		185	99	422	419	82	49	154	164	5.29	2.43

Values with different subscript letters are significantly different at alpha = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 06 , Study no: 4

Type	Species	Strip Frequency		Average Cover %	
		'96	'01	'96	'01
B	Chrysothamnus nauseosus albicaulis	2	1	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	36	27	1.18	.72
B	Gutierrezia sarothrae	36	33	1.12	.90
B	Juniperus osteosperma	3	2	7.92	5.48
B	Opuntia spp.	36	41	1.15	.90
B	Tetradymia canescens	1	3	-	.03
Total for Browse		114	107	11.39	8.03

CANOPY COVER --
Herd unit 06 , Study no: 4

Species	Percent Cover	
	'96	'01
Juniperus osteosperma	15	18

Point-Quarter Tree Data

Trees per Acre	
'96	'01
101	80

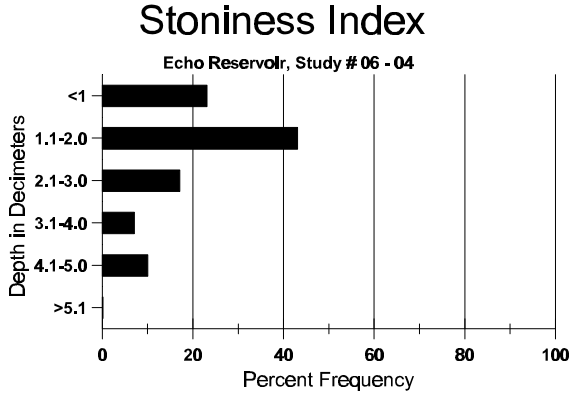
Average diameter (in)	
'96	'01
10.4	12.6

BASIC COVER --
Herd unit 06 , Study no: 4

Cover Type	Nested Frequency		Average Cover %			
	'96	'01	'84	'90	'96	'01
Vegetation	381	334	6.50	7.25	37.54	31.35
Rock	132	88	1.25	1.50	2.04	1.21
Pavement	248	262	2.25	4.50	6.47	6.97
Litter	387	348	61.00	46.50	37.07	31.57
Cryptogams	161	236	.75	7.75	6.51	16.85
Bare Ground	282	292	28.25	32.50	23.30	27.64

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 04, Echo Reservoir

Effective rooting depth (in)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
12.3	75.6 (12.1)	7.9	44.7	24.0	31.3	2.1	4.3	38.4	.5



PELLET GROUP FREQUENCY --
Herd unit 06 , Study no: 4

Type	Quadrat Frequency		Pellet Transect	
			Pellet Groups per Acre	Days Use per Acre (ha)
	'96	'01	⁄01	⁄01
Rabbit	2	19	44	N/A
Elk	5	2	104	8 (20)
Deer	31	36	818	63 (155)
Cattle	1	3	-	-

BROWSE CHARACTERISTICS --
Herd unit 06 , Study no: 4

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
Y	84	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	-	5	-	-	1	-	-	-	6	-	-	-	400	42	14	6
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	84	-	-	6	-	-	-	-	-	-	5	1	-	-	400			6
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'84	08%	92%	00%
'90	00%	00%	00%
'96	00%	00%	00%
'01	00%	00%	00%

Total Plants/Acre (excluding Dead & Seedlings)			%Change	
	'84	866	Dec:	46%
	'90	0		0%
	'96	0		0%
	'01	0		0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
D	84	-	1	1	-	-	-	-	-	-	1	-	1	-	66			2
	90	-	1	-	-	-	-	-	-	-	-	-	-	1	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	260			13
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	50%	50%	50%	-50%
'90	100%	00%	100%	
'96	00%	00%	00%	
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'84	66	Dec:		100%
'90	33			100%
'96	0			0%
'01	0			0%

Chrysothamnus nauseosus albicaulis																			
M	84	-	-	1	-	-	-	-	-	-	-	1	-	-	33	19	18	1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	27	40	0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0	21	20	0
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	1	-	-	-	-	-	-	-	-	1	-	33			1
	96	1	-	1	-	-	-	-	-	-	1	-	-	1	40			2
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	100%	00%	+ 0%
'90	00%	100%	100%	+18%
'96	00%	50%	50%	-50%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'84	33	Dec:		0%
'90	33			100%
'96	40			100%
'01	20			100%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus viscidiflorus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	28	-	-	-	-	-	-	-	-	28	-	-	-	560			28
	01	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
M	84	31	-	-	-	-	-	-	-	-	14	17	-	-	2066	12	18	31
	90	22	3	1	-	-	-	-	-	-	9	-	17	-	1733	10	14	26
	96	67	-	-	-	-	-	-	-	-	67	-	-	-	1340	8	14	67
	01	41	1	-	-	-	-	-	-	-	42	-	-	-	840	6	10	42
D	84	34	11	-	-	-	-	-	-	-	45	-	-	-	3000			45
	90	5	-	3	-	-	-	-	-	-	1	-	5	2	533			8
	96	1	1	-	-	-	-	-	-	-	2	-	-	-	40			2
	01	13	-	-	-	-	-	-	-	-	11	-	-	2	260			13

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	14%	00%	00%	-55%
'90	09%	11%	69%	-17%
'96	01%	00%	00%	-38%
'01	02%	00%	03%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	5132	Dec:	58%
	'90	2332		23%
	'96	1940		2%
	'01	1200		22%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	17	-	-	-	-	-	-	-	-	17	-	-	-	566			17
	96	35	-	-	-	-	-	-	-	-	35	-	-	-	700			35
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	90	36	-	-	-	-	-	-	-	-	31	-	4	1	1200			36
	96	29	-	-	-	-	-	-	-	-	29	-	-	-	580			29
	01	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	84	40	-	-	-	-	-	-	-	-	40	-	-	-	1333	13	14	40
	90	31	-	-	-	-	-	-	-	-	30	-	1	-	1033	8	7	31
	96	64	-	-	-	-	-	-	-	-	64	-	-	-	1280	8	10	64
	01	107	-	-	-	-	-	-	-	-	107	-	-	-	2140	6	8	107
D	84	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	90	4	-	-	-	-	-	-	-	-	3	-	-	1	133			4
	96	2	-	-	-	-	-	-	-	-	-	-	-	2	40			2
	01	10	-	-	-	-	-	-	-	-	5	-	1	4	200			10

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	+39%
'90	00%	00%	10%	-20%
'96	00%	00%	02%	+20%
'01	00%	00%	04%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	1432	Dec:	2%
	'90	2366		6%
	'96	1900		2%
	'01	2380		8%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Juniperus osteosperma																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	90	-	1	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	-	-	-	-	1	-	-	-	-	-	1	-	33	69	47	1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	2	-	-	-	-	-	-	1	-	3	-	-	-	60	-	-	3
	01	-	1	-	-	-	-	-	1	-	2	-	-	-	40	-	-	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	50%	50%	-50%
'90	100%	00%	00%	+45%
'96	00%	00%	00%	-33%
'01	50%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			Dec:	
	'84	66		-
	'90	33		-
	'96	60		-
	'01	40		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	01	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	84	11	-	-	-	-	-	-	-	-	11	-	-	-	366			11
	90	9	-	-	1	-	-	-	-	-	9	-	1	-	333			10
	96	13	-	-	-	-	-	-	-	-	13	-	-	-	260			13
	01	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
M	84	19	-	-	-	-	-	-	-	-	19	-	-	-	633	6	16	19
	90	25	-	-	-	-	-	-	-	-	18	-	7	-	833	4	16	25
	96	48	-	-	1	-	-	-	-	-	47	-	2	-	980	5	18	49
	01	51	1	-	-	-	-	24	-	-	74	1	-	1	1520	5	10	76
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	3	-	-	-	-	-	-	-	-	1	-	-	2	60			3
	01	2	-	-	-	-	-	-	-	-	1	-	-	1	40			2
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	120			6
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	120			6

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	+17%
'90	00%	00%	22%	+ 8%
'96	00%	00%	06%	+23%
'01	01%	00%	02%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	999	Dec:	0%
	'90	1199		3%
	'96	1300		5%
	'01	1680		2%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Symphoricarpos oreophilus																		
Y	84	5	-	-	-	-	-	-	-	-	5	-	-	-	333			5
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	8	4	-	-	-	-	-	-	-	12	-	-	-	800	27	25	12
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	84	-	2	-	-	-	-	-	-	-	2	-	-	-	133			2
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'84	32%	00%	00%
'90	00%	00%	00%
'96	00%	00%	00%
'01	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	1266	Dec:	11%
	'90	0		0%
	'96	0		0%
	'01	0		0%

Tetradymia canescens																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40	8	16	2
	01	-	1	-	-	-	-	-	-	-	1	-	-	-	20	12	24	1
D	84	-	2	-	-	-	-	-	-	-	-	2	-	-	66			2
	90	-	2	-	-	-	-	-	-	-	-	1	1	-	66			2
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	4	-	-	-	-	-	-	-	-	1	-	-	-	80			4

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	100%	00%	00%	+ 0%
'90	100%	00%	50%	-39%
'96	00%	00%	00%	+60%
'01	20%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	66	Dec:	100%
	'90	66		100%
	'96	40		0%
	'01	100		80%

Trend Study 6-5-01

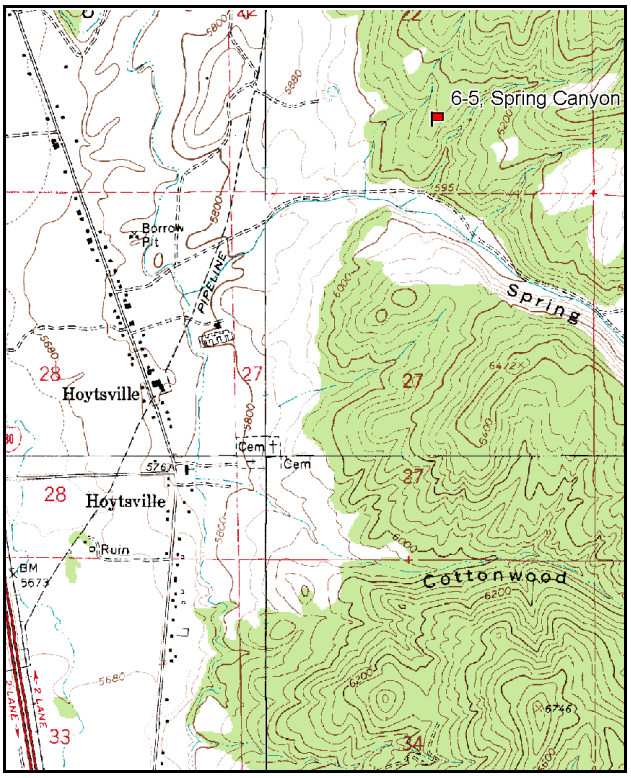
Study site name: Spring Canyon . Vegetation type: Juniper .

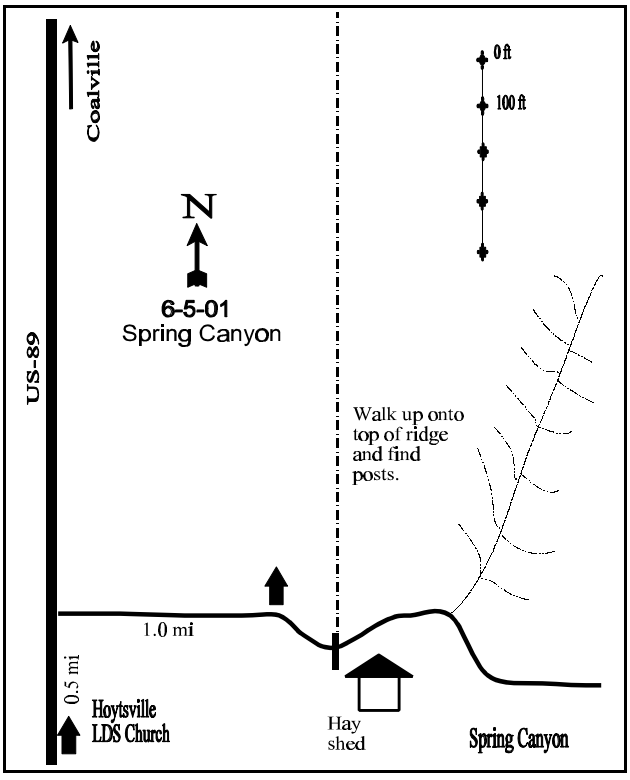
Compass bearing: frequency baseline 165 degrees magnetic.

Frequency belt placement: Line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the LDS Church in Hoytsville, travel north 0.5 miles on old U.S. 189. At 0.5 miles note a dirt road to the right with a sign "Echo-Chalk Creek Range Owners Protective Association" and turn right (east). Proceed 1.0 miles to a gate and a sharp bend to the right (south). Walk to the north side of the road to a north/south running fence. From here walk north along the fence to the 40th metal fence post. From post #40 walk 35 paces at 73 degrees true to the 400-foot baseline stake. The 0-foot stake is marked with browse tag #7953.





Map Name: Turner Hollow

Diagrammatic Sketch

Township 2N , Range 5E , Section 22

UTM 4526183 N 469139 E

DISCUSSION

Trend Study No. 6-5

The Spring Canyon study is located on a juniper covered ridge immediately east of Hoytsville and north of the mouth of Spring Canyon. The study area lies on south-facing slopes that seldom exceed 15%. The area is considered critical deer winter range and is occupied by a closed and relatively unproductive Utah juniper community. The juniper type is very uniform in this area and characterized by a moderately dense stand of uneven-aged juniper. Animal use has been heavy on the site and includes sheep, deer, and elk. Domestic sheep were on the area in late-August of 1984 when the study was initiated. Deer pellet groups have been high in all sampled years. Nine winter-killed deer were observed in the immediate vicinity in 1984. Utilization of available forage has usually approached 100% in the past. Browsing has often extended into 3-year, 4-year, and even older wood on mountain big sagebrush, true mountain mahogany, and juniper. Few preferred shrubs are found on the site anymore. A pellet group transect read on the site in 2001 estimated 58 deer days use/acre (144 ddu/ha) and less than 1 cow day use/acre (2 cdu/ha). Numerous game trails also traverse the site.

Soils on the site have a clay loam texture, and are neutral soil reaction (7.3 pH). The soil surface is rocky and the profile is also moderately stony. Effective rooting depth was estimated at just over 12 inches in 1996. Average soil temperature at 12 inches in depth was estimated at over 70˚ F. Soil temperatures this high tend to make the soil dry for long periods during the summer, making it more difficult for perennial grasses and young shrubs to become established on the site. Thus, high soil temperatures tend to favor winter annuals like cheatgrass. The erosion hazard is moderately high because of poor understory cover and low permeability. In 2001, the level of erosion ranges from slight to moderate on the site. Vegetation cover is low at only 18% in 2001. Litter was moderate (40%), but much of the litter is provided by dead juniper leaves. Cryptogams are moderately abundant (14% in 2001), which provide additional important protective cover in the absence of herbaceous vegetation.

Other than juniper, shrubs and trees are rare. Browse species consists basically of broom snakeweed, prickly pear cactus, and a few snowberry. Utah juniper is the dominant species which provides little forage. Nearly all of the juniper trees have received use over the years as evidenced by past highlining. Juniper canopy cover was estimated at 37% in 2001.

The herbaceous understory is sparse and is not an important source of cover or forage. Native perennial grasses are somewhat abundant in the more open areas, but are infrequent where the juniper overstory is dense. Bluebunch wheatgrass, Indian ricegrass, Sandberg bluegrass, squirreltail, and needle-and-thread have all been sampled on the site. Perennial grasses provided only 5% average cover in 1996 and 2001. Cheatgrass is also present, but has not reached a dominant level. Forbs consist mostly of annual and/or low-growing perennials that provide very little cover or forage. A chaining and seeding project is likely the only type of treatment that could increase vegetative diversity and production on this site.

1984 APPARENT TREND ASSESSMENT

Soil is moderately shallow and inadequately protected from erosion. The current rate of erosion is moderately high and will continue to be so. Trend appears down. Vegetative trend appears to be marginally down. It is categorized as “marginally down" only because it is difficult to imagine conditions being much worse than they currently are. Plant composition shows little evidence of significant change beyond the continuing decline of all palatable browse species, and possibly a small increase in density, cover, and production of perennial grasses. Utah juniper will likely become even more dominant than it is now. Very heavy use in the past seven years, especially the last two, has adversely affected long-term forage production potential of the

site as well as the further depletion of shrub diversity. Of particular concern is the "highlining" of juniper which formerly provided an "emergency" forage source.

1990 TREND ASSESSMENT

Unfortunately, this depleted juniper range type is representative of a majority of winter range in the area above Hoytsville. There is very little browse forage available. The steeper slopes and west exposures support a variety of browse species, but all occur in low densities, are heavily hedged, and mostly decadent. All juniper trees are highlined. Notably, bluebunch wheatgrass decreased in nested frequency while Indian ricegrass frequency was almost unchanged. These plants show evidence of recent grazing. The highly erodible soil is exposed except for the dense litter under the junipers.

TREND ASSESSMENT
soil - slightly downward (2)
browse - down (1)
herbaceous understory - down (1)

1996 TREND ASSESSMENT

This site has the lowest herbaceous cover of all the sites within management unit 6 at only 8%. This doesn't allow for very much protective cover. Percent bare ground actually increased since 1990. Trend for soil is slightly down and in poor condition. The browse trend remains down, with no preferred browse being sampled within the study area. Trend for the herbaceous understory is stable for perennial species, but it still is in very poor condition contributing only 8% cover.

TREND ASSESSMENT
soil - slightly down and in poor condition (2)
browse - down, most preferred browse is gone (1)
herbaceous understory - stable for perennial species, but still not enough cover to protect the soil (3)

2001 TREND ASSESSMENT

Trend for soil is stable. Herbaceous vegetation remains low, but litter cover is stable and cryptogamic cover increased from 3% to 14%. Bare soil remains high, but only slightly increased since 1996. Trend for browse remains down. As in previous readings, palatable, preferred browse forage is nearly nonexistent on the site. Trend for the herbaceous understory is stable, but remains in poor condition. Perennial grasses are in low abundance and forbs are insignificant. Due to the vegetative characteristics of the site at the present time, this site is really only useful as thermal cover and as a travel corridor for wildlife. A chaining and seeding project is likely the only treatment that could increase vegetative diversity and production in the area.

TREND ASSESSMENT
soil - stable (3)
browse - down (1)
herbaceous understory - stable (3)

HERBACEOUS TRENDS --
Herd unit 06 , Study no: 5

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'84	'90	'96	'01	'84	'90	'96	'01	'96	'01
G	Agropyron spicatum	$_{b}$59	$_{a}$32	$_{ab}$44	$_{ab}$53	31	13	20	23	.59	1.43
G	Bromus tectorum (a)	-	-	$_{b}$129	$_{a}$103	-	-	48	44	2.82	.42
G	Oryzopsis hymenoides	68	66	78	85	34	31	36	42	1.08	1.62
G	Poa pratensis	3	-	-	-	2	-	-	-	-	-
G	Poa secunda	$_{a}$13	$_{b}$56	$_{ab}$47	$_{b}$54	7	28	17	22	.48	.96
G	Sitanion hystrix	$_{a}$1	$_{b}$34	$_{b}$22	$_{ab}$23	1	18	12	10	.28	.51
G	Stipa comata	$_{b}$13	$_{ab}$27	$_{ab}$29	$_{a}$9	7	13	11	6	.30	.34
Total for Annual Grasses		0	0	129	103	0	0	48	44	2.82	0.42
Total for Perennial Grasses		157	215	220	224	82	103	96	103	2.75	4.86
Total for Grasses		157	215	349	327	82	103	144	147	5.58	5.28
F	Alyssum alyssoides (a)	-	-	239	262	-	-	76	91	1.10	1.05
F	Antennaria rosea	-	6	1	7	-	3	1	3	.00	.04
F	Arabis spp.	-	3	5	-	-	1	3	-	.01	-
F	Astragalus convallarius	4	-	-	-	2	-	-	-	-	-
F	Astragalus utahensis	1	-	2	1	1	-	1	1	.03	.03
F	Camelina microcarpa (a)	-	-	5	2	-	-	2	1	.01	.00
F	Chaenactis douglasii	2	-	-	-	2	-	-	-	-	-
F	Cirsium undulatum	2	-	1	-	2	-	1	-	.03	-
F	Collinsia parviflora (a)	-	-	2	3	-	-	2	1	.01	.00
F	Cryptantha spp.	30	13	21	16	16	8	11	8	.25	.45
F	Cymopterus longipes	-	2	5	3	-	2	4	2	.02	.01
F	Descurainia pinnata (a)	-	-	-	2	-	-	-	1	-	.00
F	Eriogonum umbellatum	7	2	-	-	3	1	-	-	-	-
F	Hackelia patens	-	11	7	6	-	5	4	3	.04	.04
F	Hedysarum boreale	8	-	-	-	5	-	-	-	-	-
F	Machaeranthera canescens	-	-	2	1	-	-	2	1	.01	.00
F	Microsteris gracilis (a)	-	-	$_{b}$-	$_{a}$12	-	-	-	6	-	.05
F	Penstemon humilis	1	5	3	5	1	2	1	3	.03	.01
F	Penstemon spp.	$_{b}$17	$_{a}$-	$_{a}$3	$_{a}$1	7	-	1	1	.03	.00
F	Phlox austromontana	27	20	39	37	12	8	17	18	.66	.82
F	Phlox longifolia	-	-	5	11	-	-	3	4	.01	.02
F	Ranunculus testiculatus (a)	-	-	$_{a}$86	$_{b}$166	-	-	35	61	.27	.97
F	Senecio multilobatus	-	-	2	-	-	-	1	-	.00	-
F	Sisymbrium altissimum (a)	-	-	1	-	-	-	1	-	.00	-

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'84	'90	'96	'01	'84	'90	'96	'01	'96	'01
Total for Annual Forbs		0	0	333	447	0	0	116	161	1.39	2.09
Total for Perennial Forbs		99	62	96	88	51	30	50	44	1.16	1.43
Total for Forbs		99	62	429	535	51	30	166	205	2.56	3.53

Values with different subscript letters are significantly different at alpha = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 06 , Study no: 5

Type	Species	Strip Frequency		Average Cover %	
		'96	'01	'96	'01
B	Artemisia tridentata vaseyana	0	1	-	-
B	Gutierrezia sarothrae	6	7	.20	.03
B	Juniperus osteosperma	12	12	16.73	8.39
B	Opuntia spp.	8	11	.22	.05
B	Symphoricarpos oreophilus	1	0	-	-
Total for Browse		27	31	17.15	8.47

CANOPY COVER --
Herd unit 06 , Study no: 5

Species	Percent Cover	
	'96	'01
Juniperus osteosperma	35	37

Point-Quarter Tree Data

Trees per Acre	
'96	'01
159	189

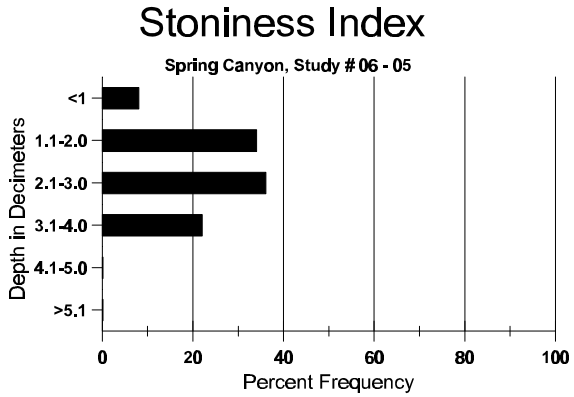
Average diameter (in)	
'96	'01
11.9	17.7

BASIC COVER --
Herd unit 06 , Study no: 5

Cover Type	Nested Frequency		Average Cover %			
	'96	'01	'84	'90	'96	'01
Vegetation	337	321	.50	1.00	25.55	18.48
Rock	129	123	1.75	6.25	2.94	2.79
Pavement	207	201	9.25	12.50	3.84	5.47
Litter	382	331	56.25	48.50	40.31	40.42
Cryptogams	152	206	2.75	5.25	3.52	14.18
Bare Ground	260	251	29.50	26.50	28.08	31.93

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 05, Spring Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
12.1	70.2 (11.9)	7.3	32.6	30.7	36.7	2.9	3.8	38.4	.6



PELLET GROUP FREQUENCY --
Herd unit 06 , Study no: 5

Type	Quadrat Frequency '96	Quadrat Frequency '01	Pellet Transect Pellet Groups per Acre 01	Pellet Transect Days Use per Acre (ha) 01
Sheep	2	-	-	-
Rabbit	12	37	339	N/A
Elk	1	1	-	-
Deer	44	22	757	58 (144)
Cattle	-	1	9	1 (2)

BROWSE CHARACTERISTICS --
Herd unit 06 , Study no: 5

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	1	-	-	-	-	-	-	-	-	-	-	1	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'84	00%	00%	00%
'90	100%	00%	100%
'96	00%	00%	00%
'01	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
'84	0	Dec:	-
'90	33		-
'96	0		-
'01	0		-

Artemisia tridentata vaseyana																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'84	00%	00%	00%
'90	00%	00%	00%
'96	00%	00%	00%
'01	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)			
'84	0	Dec:	-
'90	0		-
'96	0		-
'01	20		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus viscidiflorus																		
Y	84	-	1	-	-	-	-	-	-	-	1	-	-	-	33			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
D	84	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'84	50%	00%	00%
'90	00%	00%	00%
'96	00%	00%	00%
'01	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
'84	66	Dec:	50%
'90	0		0%
'96	0		0%
'01	0		0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	01	15	-	-	-	-	-	-	-	-	15	-	-	-	300			15
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	10	-	-	-	-	-	-	-	-	10	-	-	-	200	7	8	10
	01	3	-	-	-	-	-	1	-	-	4	-	-	-	80	5	4	4
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'84	00%	00%	00%
'90	00%	00%	00%
'96	00%	00%	00%
'01	00%	00%	05%

%Change: +40%

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	0	Dec:	0%
	'90	0		0%
	'96	240		0%
	'01	400		5%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Juniperus osteosperma																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	-	1	1	-	-	-	-	-	-	2	-	-	-	66			2
	90	-	-	-	-	-	-	1	-	-	1	-	-	-	33			1
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	-	3	3	-	-	-	-	3	-	9	-	-	-	300	67	157	9
	90	1	-	-	-	-	-	4	-	3	8	-	-	-	266	186	153	8
	96	5	-	-	-	-	-	3	3	-	11	-	-	-	220	-	-	11
	01	6	-	-	-	-	-	2	3	-	11	-	-	-	220	-	-	11
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	2	-	-	-	-	-	2	40			2
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	36%	36%	00%	-18%
'90	00%	33%	00%	-13%
'96	00%	00%	00%	+ 7%
'01	00%	00%	14%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	366	Dec:	0%
	'90	299		0%
	'96	260		0%
	'01	280		14%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	01	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	84	1	-	-	-	-	-	-	-	-	1	-	-	-	33	7	14	1
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	66	5	10	2
	96	8	-	-	-	-	-	-	-	-	8	-	-	-	160	5	12	8
	01	8	-	-	1	-	-	-	-	-	8	1	-	-	180	4	10	9
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	-	-	1	-	33			1
	96	5	-	-	-	-	-	-	-	-	1	-	4	-	100			5
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	+60%
'90	00%	00%	20%	+41%
'96	00%	00%	29%	- 7%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	66	Dec:	0%
	'90	165		20%
	'96	280		36%
	'01	260		8%

Symphoricarpos oreophilus

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	7	12	1
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	00%	00%	00%	
'96	00%	00%	00%	
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	0	Dec:	-
	'90	0		-
	'96	20		-
	'01	0		-

*****Not Read*****

Trend Study 6-6-96

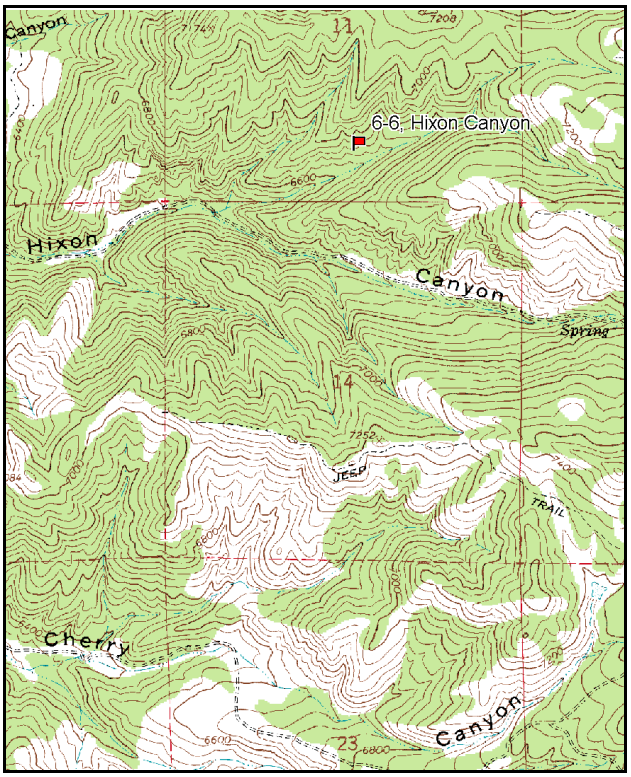
Study site name: Hixon Canyon . Vegetation type: True Mountain Mahogany .

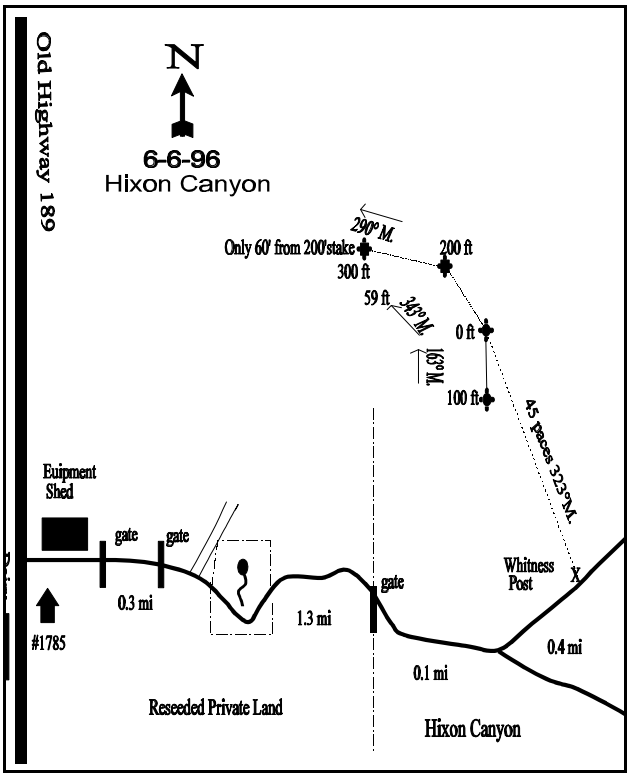
Compass bearing: frequency baseline 146 degrees magnetic.

Frequency belt placement: Line 1 (11 & 95ft), line 2 (34 & 76ft), line 3 (59ft).

LOCATION DESCRIPTION

From 1875 Old Highway 189, travel east up Hixon Canyon on a dirt road through a gate and proceed 0.3 miles to another gate. Turn right and proceed 1.3 miles to a fence with a gate. Continue 0.1 miles and turn left at the fork. This road is only shown as an intermittent stream on 1967 quad map. Proceed 0.40 miles to a white topped green steel fence post stake in a rockpile. From the rockpile, walk 45 paces at 323 degrees magnetic to the 0-foot stake of the baseline marked by browse tab #7966. The baseline runs 146 degrees. The rest of the baseline runs off the 0-foot baseline stake. Line 2 runs 326 degrees magnetic. Line 3 runs 288 degrees magnetic.





Map Name: Crandall Canyon

Diagrammatic Sketch

Township 1N , Range 5E , Section 11

UTM 4519983 N 470604 E

DISCUSSION

Trend Study No. 6-6

*******This study was not read in 2001 because project personnel could not gain access through private land. The study will be reevaluated during the next rotation. The site narrative and data tables are included from the 1996 volume 2 Utah Big Game Range Trend Studies report.

The Hixon Canyon study was established in 1984. This site is located in the upper reaches of Hixon Canyon at 6,680 feet in elevation. It samples a mixed mountain brush type on moderately steep (20-25% slope), south-facing terrain. Although it lies higher up the canyon than the old line intercept transect it replaced, this study is still within the limits of critical deer winter range. Browse utilization appears to be moderately heavy, but this appearance is exacerbated by extended drought. Pellet group frequency for deer appears to indicate moderate use (17%), with elk pellet groups displaying only light use (3%). Domestic sheep and cattle also utilize the site. There was significant use of Indian ricegrass noted in 1984.

Soil is red in color and appears to be highly erodible. Most surface rock and herbaceous plants are pedestaled. Soil texture is a sandy clay loam with a soil reaction that is moderately alkaline (7.9 pH). Percent organic matter in the soil is the lowest of all sites in the management unit at only 1.7%, where the average for the unit is 3%. The range for percent organic matter for Utah is generally from 1.5 to 5.0%. Drainage and permeability are probably quite rapid. Effective rooting depth (see methods) is moderate at a little over 12 inches. Soil temperature at this depth is about 66° F with a moderately rocky soil profile. Percent bare ground was originally quite high at 39% (1984) and now is about 18% in 1996. The ratio and distribution (nested frequency) of protective ground cover (vegetation and litter cover) to bare ground is considered only fair with a value of 1:2.8. A value of 1:3 or higher usually affords moderately good protection from high intensity summer storm events. Consequently, the erosion rate is moderate and continuing soil loss is a problem.

This site, like many mountain brush types, has a plant composition that is quite variable according to the availability of microsites. On much of the area, the key browse species (true mountain mahogany and mountain big sagebrush) and juniper provide the vegetative aspect for the community. In terms of abundance however, they provide 2%, 23%, and 56% of the browse cover respectively. From 1984 and 1990, it appeared that broom snakeweed was going to take over the site with a population that had increased to more than 22,000 plants/acre. Since then, the population is estimated at only 740 plants/acre. The drought has obviously had a detrimental effect on its density. Now only 3% of the browse cover is contributed by broom snakeweed. Both of the preferred "key" species, as well as the less abundant Saskatoon serviceberry and mountain snowberry, have sustained heavy use which has been intensified by prolonged drought. Utilization coupled with drought has effected the vigor and age structure of mountain big sagebrush and true mountain mahogany. Even stickyleaf low rabbitbrush, a species that seldom is utilized, shows moderately heavy use. Almost all of the browse populations mentioned above, but especially the key species, have excessively decadent age structures. What is most alarming on this site is the proportion of dead plants in the populations of mountain big sagebrush and true mountain mahogany at 55% and 29% respectively.

The herbaceous understory contributes little quality forage, and the majority comes from cheatgrass. Plants occur erratically and appear to be greatly effected by soil erosion. Many of the shrub interspaces are bare soil and rock. The most numerous perennial species are Sandberg bluegrass, bluebunch wheatgrass, and Indian ricegrass which are important forage species. All show evidence of considerable current utilization.

1984 APPARENT TREND ASSESSMENT

Soil is derived from conglomerate parent material and thus is highly erodible. Heavy animal use is contributing to conditions that favor rapid soil erosion, which in turn adversely affects vegetative potential. Soil trend appears down. Vegetative trend also appears to be declining due to decadent age structures and excessive browsing on the key browse species, and an apparent increase of undesirable shrubs such as broom snakeweed and prickly pear cactus.

1990 TREND ASSESSMENT

The key browse species are highly decadent and heavily used. The south-facing slope is moderately steep (35%). North-facing slopes in the area support more and healthier browse, attesting to the effects of the prolonged drought. There is some mountain mahogany recruitment with the young age class accounting for 13% of the population. The low density sagebrush population has canopy cover averaging only 2%. Undesirable woody species make up the vast majority of the browse composition. Broom snakeweed has increased by 31%. Junipers have an estimated density of 78 trees/acre. Indian ricegrass shows an increase in nested frequency with moderate utilization. There was a 78% increase in the amount of erosion pavement.

TREND ASSESSMENT
soil - downward (1)
browse - downward due to density losses for key browse species and large increase for broom snakeweed (1)
herbaceous understory - slightly improving with increased nested frequencies for Indian ricegrass and Sandberg bluegrass (4)

1996 TREND ASSESSMENT

The trend for soil is stable. Percent bare ground declined to less than 18%. Vegetation and litter cover are moderate and adequately distributed to prevent heavy erosion. The trend for the two preferred browse species is down. The proportion of the population made up of dead plants is high at 56% for mountain big sagebrush and 29% for true mountain mahogany. Percent decadency for sagebrush is also high at 62%. Mahogany is showing some improvement with only about 20% decadency, but its density is down to only 300 plants/acre. This is one of the few sites where dead mahogany was sampled. You can usually have a moderately high percent decadency, but usually no significant number of dead plants. The only real positive note for this site is that the population of broom snakeweed has decreased by 97%. The herbaceous understory (perennial component) is also down for both the grasses and forbs where most of the herbaceous cover is from annuals.

TREND ASSESSMENT
soil - stable (3)
browse - continuing downward (1)
herbaceous understory - down (1)

HERBACEOUS TRENDS --
Herd unit 06 , Study no: 6

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %
		'84	'90	'96	'84	'90	'96	'96
G	Agropyron dasystachyum	-	-	3	-	-	1	.03
G	Agropyron spicatum	$_{a}$29	$_{a}$27	$_{b}$64	13	12	28	1.64
G	Bromus tectorum (a)	-	-	269	-	-	85	6.09
G	Elymus cinereus	-	-	6	-	-	2	.53
G	Oryzopsis hymenoides	$_{b}$86	$_{b}$116	$_{a}$29	44	47	15	1.04
G	Poa bulbosa	-	-	3	-	-	1	.00
G	Poa fendleriana	-	-	1	-	-	1	.15
G	Poa secunda	$_{a}$18	$_{b}$58	$_{b}$69	7	25	29	1.97
Total for Annual Grasses		0	0	269	0	0	85	6.09
Total for Perennial Grasses		133	201	175	64	84	77	5.38
Total for Grasses		133	201	444	64	84	162	11.48
F	Alyssum alyssoides (a)	-	-	252	-	-	77	2.32
F	Artemisia ludoviciana	$_{b}$21	$_{b}$17	$_{a}$-	9	6	-	.03
F	Camelina microcarpa (a)	-	-	1	-	-	1	.00
F	Calochortus nuttallii	-	5	-	-	2	-	-
F	Chenopodium album (a)	-	-	1	-	-	1	.00
F	Chaenactis douglasii	$_{a}$9	$_{b}$53	$_{a}$3	7	27	3	.01
F	Cirsium undulatum	$_{ab}$9	$_{b}$17	$_{a}$5	5	10	2	.04
F	Comandra pallida	$_{ab}$6	$_{a}$1	$_{b}$11	3	1	4	.07
F	Cryptantha spp.	6	16	8	3	6	4	.02
F	Cynoglossum officinale	1	-	-	1	-	-	-
F	Erigeron pumilus	-	-	8	-	-	3	.01
F	Hackelia patens	6	12	11	3	5	5	.02
F	Holosteum umbellatum (a)	-	-	1	-	-	1	.00
F	Machaeranthera canescens	1	2	-	1	1	-	-
F	Oenothera caespitosa	$_{ab}$8	$_{b}$13	$_{a}$-	3	6	-	-
F	Phlox austromontana	-	-	2	-	-	1	.00
F	Phlox longifolia	-	2	-	-	2	-	-
F	Ranunculus testiculatus (a)	-	-	13	-	-	4	.02
F	Tragopogon dubius	2	1	-	1	1	-	-
Total for Annual Forbs		0	0	268	0	0	84	2.35
Total for Perennial Forbs		69	139	48	36	67	22	0.22
Total for Forbs		69	139	316	36	67	106	2.57

Values with different subscript letters are significantly different at alpha = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 06 , Study no: 6

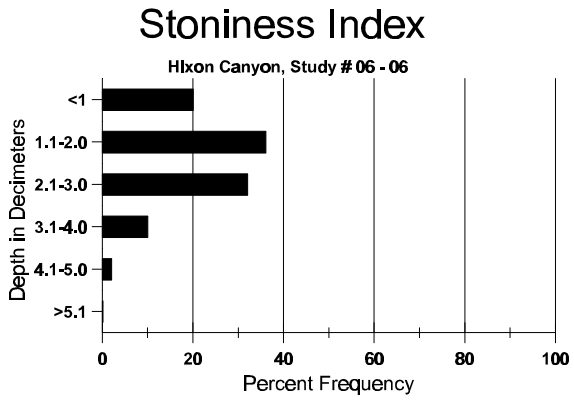
Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	2	.03
B	Artemisia tridentata vaseyana	10	.25
B	Cercocarpus montanus	15	2.93
B	Chrysothamnus viscidiflorus viscidiflorus	3	.03
B	Gutierrezia sarothrae	11	.32
B	Juniperus osteosperma	8	7.08
B	Opuntia spp.	19	.16
B	Quercus gambelii	2	1.63
B	Symphoricarpos oreophilus	1	.18
Total for Browse		71	12.62

BASIC COVER --
Herd unit 06 , Study no: 6

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	350	2.75	7.00	28.37
Rock	290	21.00	23.00	15.63
Pavement	258	4.00	18.25	10.17
Litter	388	33.25	20.50	39.14
Cryptogams	17	0	0	.09
Bare Ground	268	39.00	31.25	17.65

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 06, Hixon Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
11.3	66.3 (12.4)	7.9	46.9	25.1	28.0	1.7	9.7	19.2	.5



PELLET GROUP FREQUENCY --
Herd unit 06 , Study no: 6

Type	Quadrat Frequency '96
Rabbit	18
Elk	3
Deer	17
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 06 , Study no: 6

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
M	84	-	-	2	-	-	-	-	-	-	2	-	-	-	66	30	30	2
	90	-	-	2	-	-	-	-	-	-	2	-	-	-	66	39	31	2
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	24	24	1
D	84	-	-	1	-	-	-	-	-	-	1	-	-	-	33			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	100%	00%	-33%
'90	00%	100%	00%	-39%
'96	50%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	99	Dec:	33%
	'90	66		0%
	'96	40		50%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	2	5	-	-	-	-	-	-	7	-	-	-	233	21	28	7
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33	14	43	1
	96	2	3	-	-	-	-	-	-	-	5	-	-	-	100	18	32	5
D	84	-	-	16	-	-	-	-	-	-	14	-	-	2	533			16
	90	1	1	1	-	-	-	-	-	-	1	-	-	2	100			3
	96	3	4	1	-	-	-	-	-	-	6	-	-	2	160			8
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	320			16

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	09%	91%	09%	-78%
'90	20%	20%	40%	+36%
'96	54%	08%	15%	

Total Plants/Acre (excluding Dead & Seedlings)				
'84	766	Dec:		70%
'90	166			60%
'96	260			62%

Cercocarpus montanus																		
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	90	-	1	1	-	-	-	-	-	-	2	-	-	-	66			2
	96	1	1	1	-	-	-	-	-	-	3	-	-	-	60			3
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	2	-	-	-	-	-	-	1	1	-	-	66	22	31	2
	96	-	1	8	-	-	-	-	-	-	9	-	-	-	180	23	34	9
D	84	-	-	14	-	-	-	-	-	-	14	-	-	-	466			14
	90	-	-	11	-	-	-	-	-	-	2	-	4	5	366			11
	96	-	1	2	-	-	-	-	-	-	2	-	-	1	60			3
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	120			6

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	93%	00%	- 0%
'90	07%	93%	60%	-40%
'96	20%	73%	07%	

Total Plants/Acre (excluding Dead & Seedlings)				
'84	499	Dec:		93%
'90	498			73%
'96	300			20%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus viscidiflorus																		
M	84	4	-	3	-	-	-	-	-	-	7	-	-	-	233	20	18	7
	90	9	-	-	1	-	-	-	-	-	6	-	4	-	333	19	27	10
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60	11	19	3
D	84	-	-	2	-	-	-	-	-	-	2	-	-	-	66			2
	90	1	-	-	-	-	-	-	-	-	-	-	1	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	56%	00%	+18%
'90	00%	00%	45%	-84%
'96	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	299	Dec:	22%
	'90	366		9%
	'96	60		0%

Gutierrezia sarothrae																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	11	-	-	-	-	-	-	-	-	11	-	-	-	366			11
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	97	-	-	-	-	-	-	-	-	97	-	-	-	3233			97
	90	445	-	-	-	-	-	-	-	-	445	-	-	-	14833			445
	96	14	-	-	-	-	-	-	-	-	14	-	-	-	280			14
M	84	363	-	-	-	-	-	-	-	-	363	-	-	-	12100	9	9	363
	90	213	1	-	3	-	-	-	-	-	216	-	1	-	7233	9	10	217
	96	23	-	-	-	-	-	-	-	-	23	-	-	-	460	7	13	23
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	8	-	-	-	-	-	-	-	-	4	-	-	4	266			8
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	+31%
'90	.14%	00%	.74%	-97%
'96	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	15333	Dec:	0%
	'90	22332		1%
	'96	740		0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Juniperus osteosperma																		
M	84	2	-	-	2	-	-	-	-	-	4	-	-	-	133	60	48	4
	90	2	-	-	1	-	-	-	-	-	3	-	-	-	100	71	56	3
	96	4	-	2	-	-	-	2	-	-	8	-	-	-	160	-	-	8
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	-25%
'90	00%	00%	00%	+38%
'96	00%	25%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	133	Dec:	-
	'90	100		-
	'96	160		-

Opuntia spp.																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	4	-	-	-	-	-	-	-	-	4	-	-	-	133			4
	90	6	-	-	1	-	-	-	-	-	7	-	-	-	233			7
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	15	-	-	-	-	-	-	-	-	15	-	-	-	500	6	7	15
	90	6	-	-	1	-	-	-	-	-	6	-	1	-	233	4	8	7
	96	26	1	-	-	-	-	-	-	-	23	1	1	2	540	6	16	27
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	-	-	1	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	-21%
'90	00%	00%	13%	+11%
'96	04%	00%	11%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	633	Dec:	0%
	'90	499		7%
	'96	560		0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Quercus gambelii																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	7	-	-	7	-	-	-	140	-	-	7

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	00%	00%	00%	
'96	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	0	Dec:	-
	'90	0		-
	'96	140		-

Symphoricarpos oreophilus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	-	1	-	-	-	-	-	-	-	1	-	-	-	33	19	17	1
	90	7	-	-	-	-	-	-	-	-	-	-	7	-	233	23	24	7
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	17	37	0
D	84	-	-	1	-	-	-	-	-	-	1	-	-	-	33			1
	90	1	-	-	-	-	-	-	-	-	-	-	1	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	50%	50%	00%	+75%
'90	00%	00%	100%	-92%
'96	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	66	Dec:	50%
	'90	266		12%
	'96	20		0%

Trend Study 6-7-01

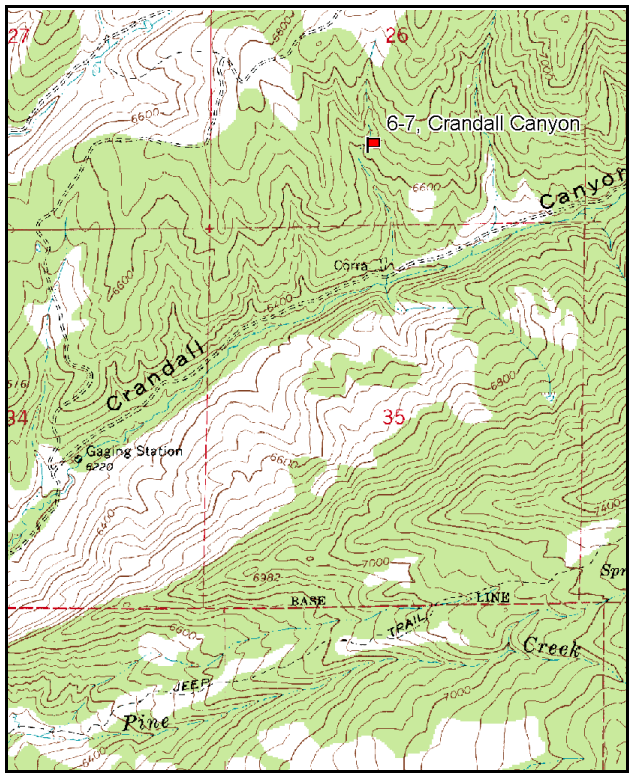
Study site name: Crandall Canyon . Vegetation type: Mountain Brush .

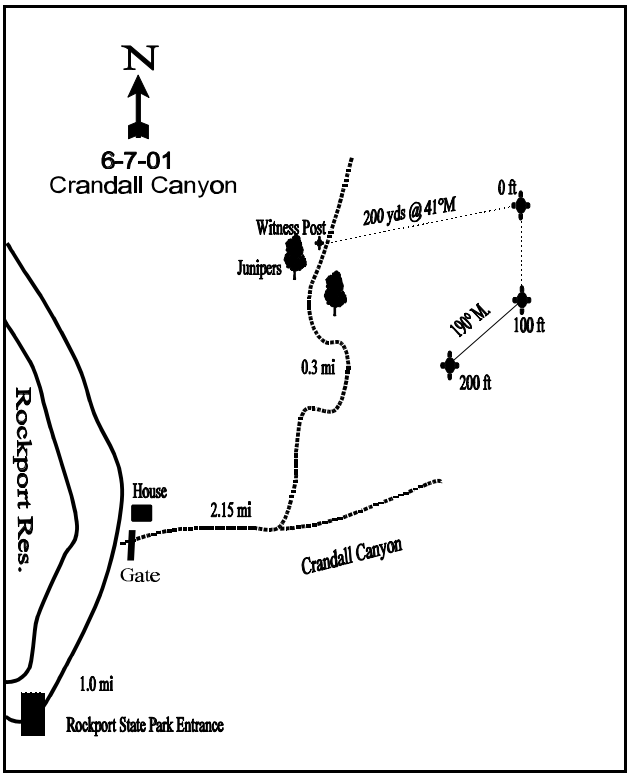
Compass bearing: frequency baseline 165 degrees magnetic.

Frequency belt placement: Line 1 (11, 31, & 71ft), line 2 (59 & 95ft).

LOCATION DESCRIPTION

From the guard house at Rockport State Park, proceed north and east on the paved road for 1.0 mile. Turn right, proceed up though the gate and up Crandall Canyon (dirt road) for 2.15 miles, and turn left at the fork. Travel 0.3 miles north on this road to a pair of junipers on either side of the road. Just past the junipers on the left hand side of the road is a witness post. From the witness post walk approximately 200 yards at 41 degrees magnetic to the 0-foot stake of the baseline. The 0-foot stake is marked by browse tag #7956. The 200-foot baseline doglegs and runs 190 degrees magnetic.





Map Name: Crandall Canyon Diagrammatic Sketch

Township 1N , Range 5E , Section 26 UTM 4514925 N 470499 E

DISCUSSION

Trend Study No. 6-7

The Crandall Canyon study is located on critical deer and elk winter range at approximately 6,640 feet in elevation. The site lies on a moderately steep (35%), southwest-facing slope. The plant community in this area is best described as mixed mountain brush that varies from mountain big sagebrush-grass to areas nearly dominated by Gambel oak. The result is a mosaic vegetative pattern that provides excellent big game habitat. Crandall Canyon is entirely private land and is intensively grazed by sheep and cattle. Deer, elk, and moose must therefore compete for available forage. The intensity of use tends to be heavy, and one or more of previous listed animal species is usually on the site at all times of the year. All classes of vegetation have shown impacts of grazing or browsing over the life of this transect. A pellet group transect read on the site in 2001 estimated 50 deer days use/acre (122 ddu/ha), 2 elk days use/acre (5 edu/ha), and 7 cow days use/acre (16 cdu/ha).

Soil texture on this site is classified as sandy clay loam. The soil reaction is moderately alkaline (8.0 pH). Phosphorus is low at 5.1 ppm, as values less than 10 ppm can be limiting to normal plant growth and development. The soil profile is moderately rocky throughout, appears well-drained, and seems to have good growth potential. Some erosion is apparent with pedestalling around some of the plants on the site. Amount of bare soil is quite high at 31% in 1996 and 41% in 2001. An erosion condition class assessment estimated slight soil erosion in 2001. Gullies appear easily formed, but many of them show signs of healing. Most of the area has been utilized heavily enough to adversely effect plant and litter cover, especially when associated with periods of drought. Sheet and gully erosion has been unacceptably high in the past, but appears to have been stabilizing in recent years. The ratio of the nested frequency of bare soil to protective ground cover (vegetation, litter, and cryptogams) was low at 1:2.4 in 1996 and 1:2.2 in 2001. A grazing system needs to be implemented that will allow for long-term improvements in soil condition and herbaceous vegetative cover.

The majority of the vegetation on the site is composed of a diverse mixture of mountain brush species. Twelve species have been sampled on the site with the principal species being true mountain mahogany, mountain snowberry, Gambel oak, serviceberry, mountain big sagebrush, and bitterbrush. Increaser shrubs include broom snakeweed, stickyleaf low rabbitbrush, and prickly pear cactus. Of the increaser species, only broom snakeweed comprises a substantial portion of the composition, making up 17% of the browse cover in 2001. The estimated density of two species, serviceberry and mountain big sagebrush, is much lower in 1996 and 2001 compared to the 1984 and 1990 readings. Both of these species have discontinuous, clumped distributions, and much of the change in density is due to the much larger sample implemented prior to the 1996 reading. In 1990, percent decadence and poor vigor were high in the populations of serviceberry, mountain big sagebrush, mountain mahogany, and snowberry. In 1996 and 2001 however, percent decadence and vigor have shown considerable improvement for all of these species. The principal species receive moderate to heavy use and appear to have stable populations. In 2001, the highest level of use was observed on mountain mahogany with 80% of the plants showing heavy use. Consistent heavy browsing on mahogany has resulted in the population being short in stature. Average leader growth on mahogany was less than 2 inches in 2001. Pocket gopher and badger diggings around plants were noted in the past, as was a moderate rust infestation on serviceberry plants. This disease does not usually kill plants, but can effect vigor.

The herbaceous understory is quite sparse for a mountain brush community. Forbs are insignificant providing only 3% average cover in 1996 and 2001. Grasses have contributed an average of 11% cover in 1996 and 2001, with perennial species providing nearly all of it. Thickspike wheatgrass, bluebunch wheatgrass, and Indian ricegrass are the most abundant perennial grasses on the site. Two annuals, cheatgrass and Japanese brome, are present, but infrequent. Both of these annual bromes have remained at low frequencies since 1996.

1984 APPARENT TREND ASSESSMENT

In spite of rather heavy big game and livestock use, this area does not appear to have a sharply declining trend. Range condition may be changing slightly downward, and if so, the rate is relatively slow. With respect to soil, there is little empirical evidence to suggest that the erosion rate is increasing. A more subjective view reveals the presence of active gullies in the area and signs of ongoing sheet erosion. Both of these observations suggest a declining soil trend. Vegetatively, the data are inconclusive. Broom snakeweed, an aggressive and undesirable increaser shrub, appears to be becoming more abundant. Both the old line intercept and Interagency studies document this. Perennial grasses may be increasing slightly in density and species diversity. This observation is somewhat tentative but if confirmed, could eventually have a detrimental effect on shrub reproduction. Utilization, especially of browse, appears to be heavier now than in 1977. Forage production appears to have remained stable since 1977. There are some very tentative clues to suggest that there may be declining populations of mountain big sagebrush and true mountain mahogany.

1990 TREND ASSESSMENT

The mixed mountain brush community on this privately-owned winter range still provides good big game habitat, although conditions have deteriorated for some species since 1984. Photo-point comparisons depict a loss of sagebrush cover and production. This is shown in the data by an increase in the percentage of decadent plants (71%), and heavier hedging. Density is slightly higher. Sagebrush canopy cover averages only 5%. The data also illustrates a slight decline in true mountain mahogany density and the loss of mature plants resulting in 88% decadence. Vigor is poor on these heavily hedged shrubs. Oakbrush, low rabbitbrush, and snakeweed increased in several, but not all measured parameters. Thickspike wheatgrass increased significantly. The nested frequency of Indian ricegrass is almost unchanged, while that of bluebunch wheatgrass was significantly lower. Forbs are relatively insignificant. The amount of litter cover decreased, percent bare ground increased, leaving the rocky soil more vulnerable to erosion.

TREND ASSESSMENT
soil - down (1)
browse - downward (1)
herbaceous understory - stable (3)

1996 TREND ASSESSMENT

Since the extended drought from 1987 to 1990, there have been some signs of recovery. Percent bare ground has decreased to 31%, and percent litter cover has also slowly increased. The gullies around the site show signs of healing. Soil trend for this site appears to be improving at this time. The overall browse trend for the site is improving except for mountain big sagebrush which now only provides 4% of the browse cover. This species seems to have reached its lowest density with almost 29% being classified as dead. With continued normal precipitation patterns this would be expected to turn around in the future. The best description for the herbaceous understory trend would be stable. Many of the species have changed either up or down, but overall it has remained basically stable for perennial species.

TREND ASSESSMENT
soil - slightly up (4)
browse - slightly up (4)
herbaceous understory - stable (3)

2001 TREND ASSESSMENT

Trend for soil is slightly down. Litter cover decreased with a corresponding increase in bare ground. Vegetative cover remained nearly stable, but the majority of the vegetative cover comes from browse which is not as effective at holding soils in place as herbaceous species. Trend for browse is stable. The principal species remain at stable densities. Percent decadency increased in the populations of mountain big sagebrush and mountain mahogany, but current levels are within acceptable limits for these species. Use remains moderate to heavy on true mountain mahogany, serviceberry, and mountain big sagebrush. Recruitment from young plants is low for big sagebrush and mahogany, but moderately high for serviceberry and snowberry. Trend for the herbaceous understory is stable. Nested frequency for thickspike, bluebunch wheatgrass, and Indian ricegrass declined, but not significantly. Sum of nested frequency for all perennial grass and forb species declined by 12% in 2001. However, this decline is not enough to warrant a downward trend at this time. Further decreases in perennial herbaceous species should be watched closely in future readings.

TREND ASSESSMENT
soil - slightly down (2)
browse - stable (3)
herbaceous understory - stable (3)

HERBACEOUS TRENDS --
Herd unit 06 , Study no: 7

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'84	'90	'96	'01	'84	'90	'96	'01	'96	'01
G	Agropyron dasystachyum	a26	c268	b126	b100	11	89	40	32	3.48	2.92
G	Agropyron spicatum	b244	a21	b147	b133	83	11	48	51	4.57	5.35
G	Bromus japonicus (a)	-	-	-	10	-	-	-	4	-	.04
G	Bromus tectorum (a)	-	-	57	40	-	-	24	21	.22	.15
G	Carex spp.	19	12	8	6	7	6	3	3	.16	.08
G	Elymus cinereus	-	-	-	1	-	-	-	1	-	.03
G	Oryzopsis hymenoides	53	53	72	49	23	26	29	26	1.62	1.81
G	Poa pratensis	-	-	1	5	-	-	1	2	.00	.06
G	Poa secunda	4	6	20	13	2	3	7	6	.18	.03
G	Sitanion hystrix	-	3	4	3	-	2	1	1	.00	.03
G	Stipa comata	a1	ab10	ab8	b15	1	5	3	6	.45	.64
Total for Annual Grasses		0	0	57	50	0	0	24	25	0.21	0.20
Total for Perennial Grasses		347	373	386	325	127	142	132	128	10.48	10.97
Total for Grasses		347	373	443	375	127	142	156	153	10.70	11.17
F	Achillea millefolium	-	-	4	1	-	-	2	1	.03	.03
F	Alyssum alyssoides (a)	-	-	215	182	-	-	71	59	1.00	.84
F	Arabis spp.	-	-	-	1	-	-	-	1	-	.00
F	Aster chilensis	a-	a-	b32	b36	-	-	11	14	.52	.48
F	Astragalus spp.	-	3	-	-	-	1	-	-	-	-

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'84	'90	'96	'01	'84	'90	'96	'01	'96	'01
F	Balsamorhiza sagittata	3	3	5	2	1	1	2	1	.06	.03
F	Camelina microcarpa (a)	-	-	-	1	-	-	-	1	-	.00
F	Calochortus nuttallii	-	-	-	5	-	-	-	3	-	.18
F	Chaenactis douglasii	4	11	13	5	2	6	7	4	.08	.04
F	Cirsium undulatum	$_{a}$9	$_{a}$5	$_{ab}$22	$_{b}$27	6	4	11	18	.63	.90
F	Collomia linearis (a)	-	-	-	3	-	-	-	1	-	.00
F	Comandra pallida	28	12	28	25	11	6	13	15	.19	.22
F	Cryptantha spp.	$_{a}$19	$_{b}$34	$_{a}$22	$_{ab}$30	9	21	10	12	.27	.50
F	Descurainia pinnata (a)	-	-	1	-	-	-	1	-	.00	-
F	Epilobium brachycarpum (a)	-	-	1	-	-	-	1	-	.00	-
F	Eriogonum umbellatum	-	3	-	-	-	1	-	-	-	-
F	Hackelia patens	$_{b}$32	$_{a}$10	$_{ab}$21	$_{a}$8	16	6	11	3	.20	.04
F	Lactuca serriola	-	-	1	-	-	-	1	-	.00	-
F	Oenothera caespitosa	-	-	-	1	-	-	-	1	-	.03
F	Penstemon humilis	11	6	9	15	7	4	4	8	.09	.18
F	Ranunculus testiculatus (a)	-	-	$_{a}$-	$_{b}$14	-	-	-	5	-	.02
F	Smilacina racemosa amplexicaulis	-	-	6	3	-	-	4	1	.07	.03
F	Tragopogon dubius	2	-	4	-	1	-	3	-	.06	-
F	Unknown forb-perennial	3	-	-	-	1	-	-	-	-	-
Total for Annual Forbs		0	0	217	200	0	0	73	66	1.01	0.88
Total for Perennial Forbs		111	87	167	159	54	50	79	82	2.24	2.71
Total for Forbs		111	87	384	359	54	50	152	148	3.25	3.59

Values with different subscript letters are significantly different at alpha = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 06 , Study no: 7

Type	Species	Strip Frequency		Average Cover %	
		'96	'01	'96	'01
B	Amelanchier alnifolia	22	25	1.68	1.17
B	Artemisia tridentata vaseyana	13	11	.94	.56
B	Cercocarpus montanus	38	38	5.02	4.66
B	Chrysothamnus viscidiflorus viscidiflorus	20	23	.74	1.50
B	Gutierrezia sarothrae	82	77	4.02	3.67
B	Juniperus osteosperma	2	6	2.39	3.37
B	Opuntia spp.	10	7	.51	.45
B	Purshia tridentata	1	1	.63	.38
B	Quercus gambelii	6	8	2.65	1.66
B	Rosa woodsii	0	1	.15	-
B	Symphoricarpos oreophilus	19	19	2.75	3.59
B	Tetradymia canescens	4	3	.18	.38
Total for Browse		217	219	21.69	21.43

CANOPY COVER --
Herd unit 06 , Study no: 7

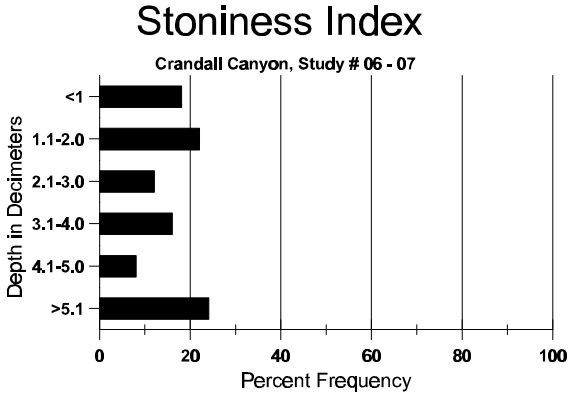
Species	Percent Cover	
	'96	'01
Juniperus osteosperma	7	7
Quercus gambelii	1	3

BASIC COVER --
Herd unit 06 , Study no: 7

Cover Type	Nested Frequency		Average Cover %			
	'96	'01	'84	'90	'96	'01
Vegetation	353	330	4.50	9.50	34.75	37.41
Rock	153	147	2.75	4.75	3.69	3.95
Pavement	229	268	11.25	7.25	5.34	4.38
Litter	388	347	46.50	37.00	38.81	26.92
Cryptogams	3	-	.25	0	.03	0
Bare Ground	311	314	34.75	41.50	31.27	41.62

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 07, Crandall Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
15.8	68.0 (14.8)	8.0	58.7	12.0	29.3	1.7	5.1	32.0	.5



PELLET GROUP FREQUENCY --
Herd unit 06 , Study no: 7

Type	Quadrat Frequency		Pellet Transect	
			Pellet Groups per Acre	Days Use per Acre (ha)
	'96	'01	01	01
Rabbit	-	11	252	N/A
Elk	5	2	26	2 (5)
Deer	15	22	644	50 (122)
Cattle	-	1	78	7 (16)

BROWSE CHARACTERISTICS --
Herd unit 06 , Study no: 7

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	2	-	3	-	-	3	-	-	8	-	-	-	533			8
	96	4	-	1	-	1	-	-	-	-	6	-	-	-	120			6
	01	4	1	1	2	-	-	-	-	-	8	-	-	-	160			8
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	3	4	11	1	-	-	-	-	16	-	4	-	400	21	22	20
	01	4	4	6	-	2	2	2	-	-	20	-	-	-	400	22	27	20
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	1	3	-	1	-	2	2	-	4	-	-	5	600			9
	96	-	-	1	1	1	-	-	-	-	3	-	-	-	60			3
	01	-	2	1	-	-	1	-	-	-	1	-	1	2	80			4
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	24%	18%	29%	-49%
'96	21%	21%	14%	+ 9%
'01	28%	34%	09%	

Total Plants/Acre (excluding Dead & Seedlings)			Dec:
'84	0		0%
'90	1133		53%
'96	580		10%
'01	640		13%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	3	-	1	-	-	-	-	-	-	4	-	-	-	80			4
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	1	4	1	-	-	-	-	-	-	6	-	-	-	400	20	23	6
	90	-	1	4	-	-	-	-	-	-	5	-	-	-	333	19	23	5
	96	2	4	5	1	-	-	-	-	-	12	-	-	-	240	14	25	12
	01	2	4	3	-	-	-	-	-	-	9	-	-	-	180	16	26	9
D	84	-	3	3	-	-	-	-	-	-	6	-	-	-	400			6
	90	5	1	6	-	-	-	-	-	-	5	-	3	4	800			12
	96	-	-	1	-	-	-	-	-	-	1	-	-	-	20			1
	01	-	1	3	-	-	-	-	-	-	4	-	-	-	80			4
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	140			7
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	62%	31%	00%	+24%
'90	12%	59%	41%	-70%
'96	24%	41%	00%	-18%
'01	36%	43%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'84	866	Dec:		46%
'90	1133			71%
'96	340			6%
'01	280			29%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Cercocarpus montanus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	2	-	-	-	-	-	-	-	2	-	-	-	133			2
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	5	6	-	-	-	-	-	-	-	11	-	-	-	220			11
	01	-	-	2	-	-	-	-	-	-	2	-	-	-	40			2
M	84	-	-	9	-	-	-	-	-	-	9	-	-	-	600	17	18	9
	90	-	1	-	-	-	-	-	-	-	1	-	-	-	66	6	10	1
	96	1	2	24	9	7	-	-	-	-	42	-	1	-	860	21	29	43
	01	1	3	26	1	1	15	-	-	-	47	-	-	-	940	26	35	47
D	84	-	1	8	-	-	-	-	-	-	9	-	-	-	600			9
	90	-	1	11	-	-	2	-	-	-	9	-	1	4	933			14
	96	-	-	-	2	-	-	-	-	-	2	-	-	-	40			2
	01	6	-	1	-	-	4	-	-	-	3	-	-	8	220			11
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	15%	85%	00%	-20%
'90	13%	81%	31%	+ 5%
'96	27%	43%	02%	+ 7%
'01	07%	80%	13%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	1333	Dec:	45%
	'90	1065		88%
	'96	1120		4%
	'01	1200		18%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus viscidiflorus																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	21	-	-	-	-	-	-	-	-	19	-	2	-	1400			21
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	01	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	44	2	-	1	-	-	-	-	-	23	-	24	-	3133	9	7	47
	96	42	1	1	4	-	-	-	-	-	48	-	-	-	960	10	12	48
	01	79	-	-	-	-	-	-	-	-	79	-	-	-	1580	8	11	79
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	9	13	-	-	-	-	4	-	-	12	-	3	11	1733			26
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	16%	00%	43%	-84%
'96	02%	02%	00%	+38%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	0	Dec:	0%
	'90	6266		28%
	'96	1020		4%
	'01	1640		0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	35	-	-	-	-	-	-	-	-	35	-	-	-	2333			35
	96	31	-	-	-	-	-	-	-	-	31	-	-	-	620			31
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	36	-	-	7	-	-	-	-	-	43	-	-	-	2866			43
	96	41	-	-	-	-	-	-	-	-	41	-	-	-	820			41
	01	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
M	84	66	1	-	-	-	-	-	-	-	67	-	-	-	4466	11	13	67
	90	63	-	-	1	-	-	1	-	-	63	-	2	-	4333	8	7	65
	96	341	-	-	-	-	-	-	-	-	341	-	-	-	6820	9	11	341
	01	488	-	-	-	-	-	-	-	-	488	-	-	-	9760	6	8	488
D	84	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	90	12	-	-	-	-	-	-	-	-	10	-	-	2	800			12
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	37	-	-	-	-	-	-	-	-	15	-	3	19	740			37
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	520			26

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	01%	00%	00%	+43%
'90	00%	00%	03%	- 4%
'96	00%	00%	00%	+28%
'01	00%	00%	04%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	4599	Dec:	3%
	'90	7999		10%
	'96	7640		0%
	'01	10680		7%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Juniperus osteosperma																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	01	5	-	-	-	-	-	-	1	-	6	-	-	-	120	-	-	6
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	00%	00%	00%	
'96	00%	00%	00%	+67%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	0	Dec:	-
	'90	0		-
	'96	40		-
	'01	120		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	3	-	-	-	-	-	-	-	-	3	-	-	-	200	10	7	3
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	133	6	6	2
	96	15	-	-	1	-	-	-	-	-	16	-	-	-	320	5	15	16
	01	9	-	-	-	-	-	-	-	-	9	-	-	-	180	4	9	9
D	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	6	-	-	-	-	-	-	-	-	2	-	-	4	120			6

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	-50%
'90	00%	00%	00%	+48%
'96	00%	00%	00%	-21%
'01	00%	00%	27%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	399	Dec:	17%
	'90	199		0%
	'96	380		0%
	'01	300		40%

Purshia tridentata																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
	01	3	-	-	-	-	-	-	-	-	3	-	-	-	60	14	51	3
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	00%	00%	00%	
'96	50%	00%	00%	+33%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	0	Dec:	0%
	'90	0		0%
	'96	40		50%
	'01	60		0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Quercus gambelii																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	9	-	-	1	-	-	-	-	-	10	-	-	-	666			10
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	8	2	1	-	-	-	-	-	-	11	-	-	-	733			11
	90	33	13	1	1	-	-	-	-	-	43	-	5	-	3200			48
	96	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
	01	6	-	-	11	-	-	-	-	-	17	-	-	-	340			17
M	84	-	6	11	-	-	2	-	-	-	19	-	-	-	1266	30	19	19
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	28	-	-	2	-	-	-	-	-	30	-	-	-	600	28	18	30
	01	23	-	-	23	-	-	3	-	-	49	-	-	-	980	47	24	49
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	11	4	3	-	-	-	-	-	-	11	-	6	1	1200			18
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	27%	47%	00%	+55%
'90	26%	06%	18%	-84%
'96	00%	00%	00%	+45%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'84	1999	Dec:	0%
'90	4400		27%
'96	720		0%
'01	1320		0%

Rosa woodsii																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	16	10	0
	01	2	-	-	-	-	-	-	-	-	2	-	-	-	40	9	6	2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	00%	00%	00%	
'96	00%	00%	00%	
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'84	0	Dec:	-
'90	0		-
'96	0		-
'01	40		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Symphoricarpos oreophilus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	1	-	-	-	-	1	-	-	2	-	-	-	133			2
	96	14	-	-	3	-	-	-	-	-	17	-	-	-	340			17
	01	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	5	12	1	7	1	-	-	-	-	26	-	-	-	520	16	26	26
	01	13	-	-	6	-	-	3	-	-	22	-	-	-	440	18	29	22
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	2	6	1	1	-	-	1	-	-	3	-	-	8	733			11
	96	1	2	-	1	-	-	-	-	-	3	-	-	1	80			4
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	54%	08%	62%	+ 8%
'96	32%	02%	02%	-40%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	0	Dec:	0%
	'90	866		85%
	'96	940		9%
	'01	560		0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Tetradymia canescens																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	8	-	-	-	-	-	-	-	9	-	-	-	180	15	18	9
	01	3	-	-	1	-	-	-	-	-	4	-	-	-	80	10	15	4

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	00%	00%	00%	
'96	90%	00%	00%	-50%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			Dec:	
	'84	0		-
	'90	0		-
	'96	200		-
	'01	100		-

*****Not Read*****

Trend Study 6-8-96

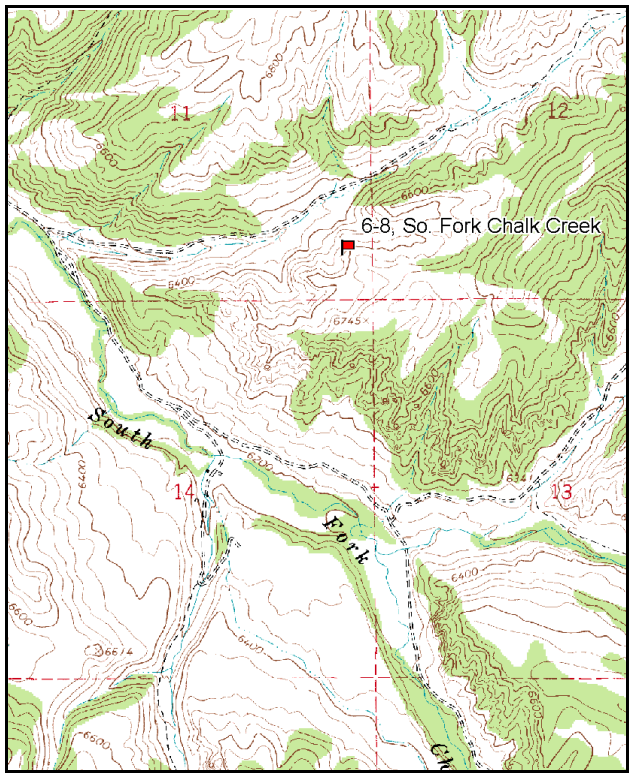
Study site name: South Fork Chalk Creek . Vegetation type: Mountain Brush .

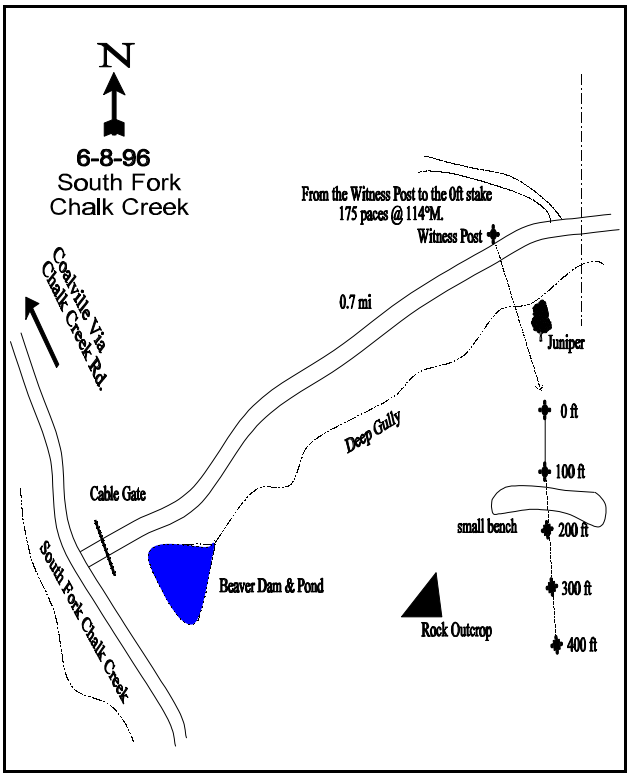
Compass bearing: frequency baseline 121 degrees magnetic.

Frequency belt placement: Line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From Coalville, go up Chalk Creek to the South Fork Road. Go up the South fork of Chalk Creek approximately 3 miles to a cable gate at the mouth of Cottonwood Canyon. Go up this side canyon 0.7 miles to a witness post and park. A lone juniper should be across the flat on the other side of a deep gully. Cross the gully and walk up the slope approximately 175 paces at 114 degrees magnetic from the witness post to the 0-foot baseline stake which is located just below a knoll of conglomerate rock on the ridge. All study stakes are short fenceposts, the 0-foot stake has a white top.





Map Name: Upton

Diagrammatic Sketch

Township 2N , Range 6E , Section 11

UTM 4529544 N 480731 E

DISCUSSION

Trend Study No. 6-8

*******This study was not read in 2001 because permission to access this private land was not obtained. This study will be reevaluated during the next rotation. Maps, data tables, and a site narrative for this study are included from the 1996 volume 2 Utah Big Game Range Trend Studies report.

The South Fork Chalk Creek trend study was established in 1990 and is located in a wide side canyon of the South Fork of Chalk Creek. The area is privately-owned, as is all of the winter range in the area. The study is on a northwest-facing slope, which supports a mixed mountain brush community dominated by mountain big sagebrush. Mountain big sagebrush contributed 64% of the browse cover in 1996. The south-facing slopes in the area have juniper and sparse stands of sagebrush. The bottoms of the canyon have been sprayed to kill shrubs. Cattle use is heavy in the bottom areas. The ridges to the south had also recently burned prior to the 1996 reading. All these factors tend to concentrate deer use on the areas where browse forage still remains. Quadrat frequency pellet group data indicates that deer use is moderately high (38%), while that of elk (8%) and cattle (3%) is considered light.

The study site is on a ridge with a northwest exposure and a moderately steep slope (56%) at an elevation of 6,600 feet. Soil texture is a sandy clay loam with a slightly acidic soil reaction (6.2 pH). Effective rooting depth is the most shallow of any site in this management unit at 8 inches. This is mostly because the soil surface and profile are rocky with rock-pavement covering 25% of the ground surface. However, vegetative cover, litter cover, and percent organic matter is above average when compared to other sites within the area. There is a very deep gully in the canyon bottom.

The study samples a sagebrush covered ridge with components of serviceberry, true mountain mahogany, and snowberry. Sagebrush cover is currently estimated at 16% with a density of 4,220 plants/acre. The sagebrush has a moderately hedged growth form. Vigor and production varies, but is generally good. Those classified with poor vigor have decreased from 23% to 9%. Overall leader growth was low in 1990, but now appears to be average. The mountain mahogany had been heavily used in 1990 and also had poor vigor (20%) related to the drought. In 1996, poor vigor decreased to only 5% of the population. Low rabbitbrush and broom snakeweed are fairly common on the more shallow soils. Low rabbitbrush is not currently increasing, but broom snakeweed has the characteristics of an expanding population with a high biotic potential (proportion seedlings to the population density) at 46%, and a high proportion of young in the population (41%).

Sandberg bluegrass and cheatgrass are the most common grasses. A wide variety and high diversity of perennial forbs occupy the site, yet together they only provide about 4% total cover. Yarrow, silvery lupine, and redroot buckwheat are the most prevalent of the 37 species encountered.

1990 APPARENT TREND ASSESSMENT

There is a large amount of rock exposed, but the remaining soil on the site is well protected and currently appears stable. The populations of the key browse species also appear stable with respect to age class structure. However, continued heavy use and the resulting increased decadence could lead to downward vegetative trends. Quality winter range is limited in the area due to past and current management practices on private lands. An end to the drought would help mitigate these downward changes.

1996 TREND ASSESSMENT

Soil trend is slightly improving with percent bare ground decreasing from 12% to 7%. Litter cover has also increased. Also, the nested frequency ratio of bare ground to vegetation and litter (protective ground cover) is quite good at 1:4.7. Usually any value > 1:3 shows little problem with erosion from high intensity summer storms. The key browse species is mountain big sagebrush which contributes 64% of the total browse cover. Population density has gone down slightly, but what is more important is the low proportion of dead plants in the population (17%). Moderate to heavy use has increased from 67% to 84% of the population, but percent decadence has slightly declined from 41% to 37%. Additionally, the proportion of the decadent plants that were classified as having poor vigor or dying has also decreased from 55% to 23% indicating that it has turned the corner and the loss of plants has now stopped. Other key browse species include serviceberry, true mountain mahogany, and mountain snowberry. These species appear to have stable populations while providing another 14% of the browse cover. Trend for browse, where the key species is mountain big sagebrush (64% of the browse cover), is currently stable. Trend for the herbaceous understory is slightly down with a significantly lower sum of nested frequency for perennial grasses which make up 79% of the herbaceous cover.

TREND ASSESSMENT
soil - slightly improving (4)
browse - stable at this time, (3)
herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --
Herd unit 06 , Study no: 8

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover %
		'90	'96	'90	'96	'96
G	Agropyron spicatum	137	*56	52	24	.81
G	Bromus tectorum (a)	-	155	-	47	3.54
G	Carex spp.	29	*57	14	26	1.71
G	Poa fendleriana	104	119	41	48	2.19
G	Poa pratensis	2	1	1	1	.00
G	Poa secunda	301	*223	93	72	7.41
G	Sitanion hystrix	12	14	6	8	.14
G	Stipa columbiana	4	6	1	2	.18
G	Stipa lettermani	-	5	-	3	.07
G	Vulpia octoflora (a)	-	4	-	2	.01
Total for Annual Grasses		0	159	0	49	3.55
Total for Perennial Grasses		589	481	208	184	12.53
Total for Grasses		589	640	208	233	16.09
F	Achillea millefolium	63	73	29	29	1.25
F	Agoseris glauca	8	4	3	3	.01
F	Alyssum alyssoides (a)	-	54	-	19	.24
F	Allium spp.	2	-	2	-	-
F	Antennaria rosea	33	*19	19	8	.19

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover %
		'90	'96	'90	'96	'96
F	Arabis spp.	5	15	3	7	.03
F	Astragalus beckwithii	-	2	-	1	.03
F	Astragalus convallarius	17	*5	9	2	.03
F	Astragalus utahensis	6	8	4	4	.23
F	Castilleja linariaefolia	11	19	7	11	.13
F	Calochortus nuttallii	1	1	1	1	.00
F	Cirsium undulatum	-	*15	-	9	.29
F	Collinsia parviflora (a)	-	29	-	9	.07
F	Cordylanthus ramosus (a)	-	5	-	4	.19
F	Crepis acuminata	24	*9	12	4	.02
F	Cruciferae	3	-	1	-	-
F	Cryptantha spp.	-	1	-	1	.00
F	Cymopterus spp.	1	-	1	-	-
F	Epilobium brachycarpum (a)	-	3	-	1	.00
F	Erigeron pumilus	38	*16	19	8	.14
F	Eriogonum racemosum	34	42	18	20	.35
F	Erigeron strigosis	-	*23	-	11	.13
F	Eriogonum umbellatum	12	*2	6	1	.03
F	Gayophytum ramosissimum (a)	-	10	-	4	.02
F	Hackelia patens	5	4	3	4	.02
F	Heuchera parvifolia	1	-	1	-	-
F	Holosteum umbellatum (a)	-	8	-	3	.01
F	Lupinus argenteus	3	*18	2	10	.39
F	Machaeranthera canescens	3	3	1	2	.04
F	Penstemon spp.	-	4	-	2	.03
F	Phlox longifolia	24	25	13	11	.15
F	Polygonum douglasii (a)	-	53	-	30	.14
F	Ranunculus spp.	2	-	1	-	-
F	Senecio integerrimus	1	-	1	-	-
F	Senecio multilobatus	3	-	1	-	-
F	Tragopogon dubius	-	8	-	3	.01
F	Unknown forb-perennial	27	*-	13	-	-
Total for Annual Forbs		0	162	0	70	0.69
Total for Perennial Forbs		327	316	170	152	3.55
Total for Forbs		327	478	170	222	4.25

* Indicates significant difference at alpha = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 06 , Study no: 8

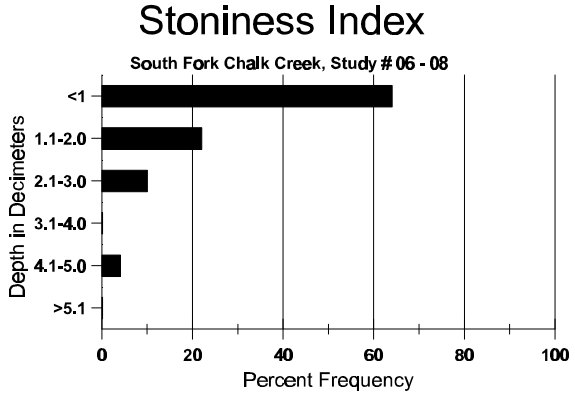
Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	19	1.51
B	Artemisia tridentata vaseyana	83	16.14
B	Cercocarpus montanus	20	.86
B	Chrysothamnus nauseosus albicaulis	1	.38
B	Chrysothamnus viscidiflorus viscidiflorus	52	3.02
B	Eriogonum heracleoides	13	.63
B	Gutierrezia sarothrae	23	.61
B	Quercus gambelii	3	.79
B	Symphoricarpos oreophilus	26	1.37
B	Tetradymia canescens	3	-
Total for Browse		243	25.34

BASIC COVER --
Herd unit 06 , Study no: 8

Cover Type	Nested Frequency '96	Average Cover % '90	'96
Vegetation	366	13.75	45.09
Rock	303	10.00	18.52
Pavement	218	13.50	6.75
Litter	396	42.50	46.06
Cryptogams	119	7.50	5.89
Bare Ground	162	12.75	7.04

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 08, South Fork Chalk Creek

Effective rooting depth (in)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
8.0	71.6 (9.0)	6.2	54.9	23.7	21.4	4.9	14.6	89.6	.4



PELLET GROUP FREQUENCY --
Herd unit 06 , Study no: 8

Type	Quadrat Frequency '96
Rabbit	2
Elk	8
Deer	38
Cattle	3

BROWSE CHARACTERISTICS --
Herd unit 06 , Study no: 8

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
Y	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	4	-	2	-	-	-	-	-	-	4	2	-	-	120			6
M	90	-	-	1	-	-	-	-	-	-	1	-	-	-	66	13	19	1
	96	2	9	5	-	3	-	-	-	-	9	2	8	-	380	18	28	19
D	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	2	-	-	-	-	-	-	-	-	-	2	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'90	00%	100%	00%	+88%
'96	52%	26%	37%	

Total Plants/Acre (excluding Dead & Seedlings)			Dec:	
	'90	66		0%
	'96	540		7%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	90	13	-	-	-	-	-	-	-	-	13	-	-	-	866			13
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	90	19	11	-	-	-	-	1	-	-	31	-	-	-	2066			31
	96	5	8	-	-	-	-	-	-	-	13	-	-	-	260			13
M	90	1	10	4	-	-	-	1	-	-	15	1	-	-	1066	18	31	16
	96	13	81	25	1	-	-	-	-	-	119	-	1	-	2400	22	36	120
D	90	5	14	14	-	-	-	-	-	-	15	-	-	18	2200			33
	96	10	47	18	3	-	-	-	-	-	60	-	8	10	1560			78
X	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	840			42

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'90	44%	23%	23%	-21%
'96	64%	20%	09%	

Total Plants/Acre (excluding Dead & Seedlings)				
'90	5332	Dec:		41%
'96	4220			37%

Cercocarpus montanus																		
S	90	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	90	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	7	4	-	-	-	-	-	-	11	-	-	-	220			11
M	90	-	-	2	-	-	-	-	-	-	2	-	-	-	133	13	19	2
	96	-	3	18	4	-	1	-	-	-	22	2	2	-	520	21	27	26
D	90	-	-	1	1	-	-	-	-	-	1	-	-	1	133			2
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'90	00%	80%	20%	+55%
'96	27%	62%	05%	

Total Plants/Acre (excluding Dead & Seedlings)				
'90	332	Dec:		40%
'96	740			0%

Chrysothamnus nauseosus albicaulis																		
Y	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	26	45	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'90	00%	00%	00%	-70%
'96	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'90	66	Dec:		-
'96	20			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus viscidiflorus																		
Y	90	21	-	-	-	-	-	-	-	-	18	-	3	-	1400			21
	96	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
M	90	16	4	-	1	-	-	-	-	-	18	-	3	-	1400	10	14	21
	96	101	1	-	3	-	-	-	-	-	105	-	-	-	2100	13	19	105
D	90	17	-	-	2	1	-	2	-	-	11	-	2	9	1466			22
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
X	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'90	08%	00%	27%	-45%
'96	.85%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'90	4266	Dec:		34%
'96	2340			3%

Eriogonum heracleoides																		
Y	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	26	3	-	2	-	-	-	-	-	31	-	-	-	620	6	8	31

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'90	00%	00%	00%	
'96	09%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'90	0	Dec:	-
'96	660		-

Gutierrezia sarothrae																		
S	90	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	96	52	-	-	-	-	-	-	-	-	52	-	-	-	1040			52
Y	90	4	1	-	-	-	-	-	-	-	5	-	-	-	333			5
	96	46	-	-	-	-	-	-	-	-	46	-	-	-	920			46
M	90	11	-	-	1	-	-	-	-	-	12	-	-	-	800	6	8	12
	96	66	-	-	-	-	-	-	-	-	66	-	-	-	1320	8	9	66

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'90	06%	00%	00%	+49%
'96	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'90	1133	Dec:	-
'96	2240		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Quercus gambelii																		
M	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	9	-	-	-	-	-	-	-	-	9	-	-	-	180	37	41	9
% Plants Showing				Moderate Use			Heavy Use			Poor Vigor						%Change		
		'90		00%			00%			00%								
		'96		00%			00%			00%								
Total Plants/Acre (excluding Dead & Seedlings)													'90		0	Dec:		-
													'96		180			-
Symphoricarpos oreophilus																		
S	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	12	-	-	2	-	-	-	-	-	14	-	-	-	280			14
M	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	21	10	-	6	-	-	-	-	-	36	-	1	-	740	15	21	37
D	90	-	1	1	1	2	-	4	-	-	6	-	-	3	600			9
	96	1	-	-	-	-	-	-	-	-	-	-	1	-	20			1
% Plants Showing				Moderate Use			Heavy Use			Poor Vigor						%Change		
		'90		33%			11%			33%						+42%		
		'96		19%			00%			04%								
Total Plants/Acre (excluding Dead & Seedlings)													'90		600	Dec:		100%
													'96		1040			2%
Tetradymia canescens																		
Y	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20	10	15	1
% Plants Showing				Moderate Use			Heavy Use			Poor Vigor						%Change		
		'90		00%			00%			00%								
		'96		33%			00%			00%								
Total Plants/Acre (excluding Dead & Seedlings)													'90		0	Dec:		-
													'96		60			-

Trend Study 6-9-01

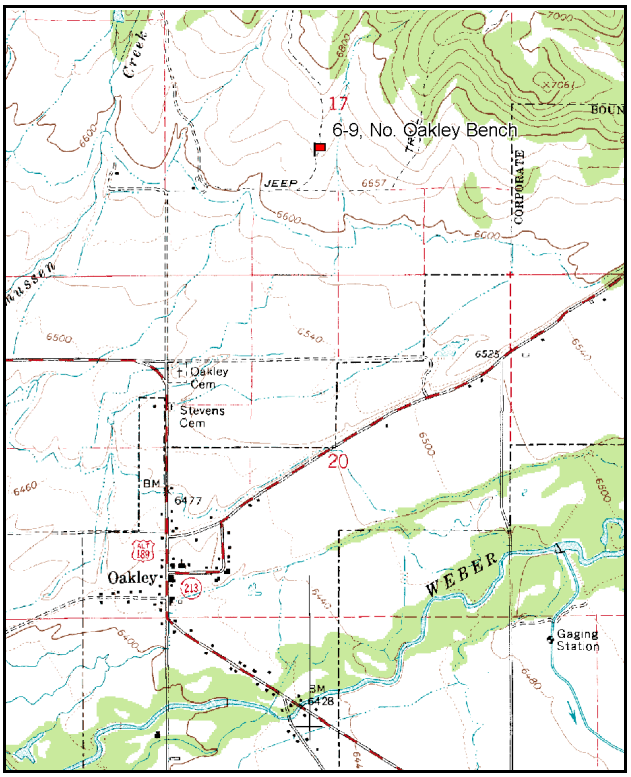
Study site name: North Oakley Bench . Vegetation type: Mountain brush .

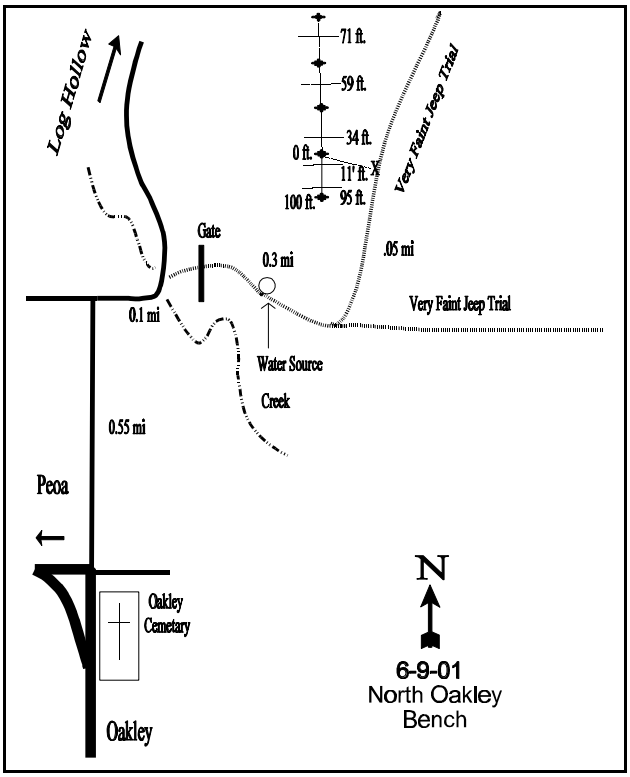
Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: Line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the Oakley cemetery, just north of Oakley, proceed north 0.55 miles to an intersection and turn right. Proceed east 0.1 miles to a gate, pass through gate (private land; key needed) with creek on immediate right. Continue on a faint road for 0.3 miles to a fork. Turn left and proceed 0.05 miles to a witness post. From the witness post walk 7 paces at 248 degrees magnetic to the 0-foot baseline stake. The first 100 feet of the baseline runs 180 degrees magnetic. The remaining 300 feet run off the 0-foot baseline stake at 343 degrees magnetic.





Map Name: Kamas

Diagrammatic Sketch

Township 1S , Range 6E , Section 17

UTM 4508895 N 475394 E

DISCUSSION

Trend Study No. 6-9

The North Oakley Bench study lies on a relatively uniform mountain big sagebrush-grass type with a mixture of mountain brush. The study area is on a gently sloping, south-facing exposure. There is very little useful escape or thermal cover close to the study site. Elevation is approximately 6,600 feet. The area is privately owned, which means that the winter range is also used by domestic livestock most of the year. Judging from pellet group frequency and forage utilization, the level of use from both game and livestock varies from moderate to heavy. Pellet group quadrat frequency data indicates use by deer, elk, and cattle to be light to moderate in 1996 and 2001. A pellet group transect read on the site in 2001 estimated 29 elk days use/acre (73 edu/ha), 19 deer days use/acre (48 ddu/ha), and 22 cow days use/acre (54 cdu/ha). The range monitoring crew had to pass through a large group of cattle to reach the study in 2001. This area, because of its location, has high potential for residential homes. Ants were extremely abundant on the site in 2001.

Soils are alluvially deposited from sedimentary parent material. Soil depth should not be limiting, although a large amount of rock does exist within the profile. It could be classified as having very high amounts of cobblestone in the soil which probably has rather poor water holding capability in the upper horizon. Effective rooting depth was estimated at nearly 10 inches with a clay loam soil texture and a neutral soil reaction (7.0 pH). During the height of the drought (1987-1990), some trampling damage and soil compaction were evident from livestock in the past, but are less evident at this time. Protective ground cover is adequate to prevent most soil loss. Erosion is minimal, primarily because of the gentle terrain and high proportion of cover contributed by the herbaceous understory. A soil erosion condition class assessment completed in 2001 determined soils as stable.

The key preferred browse species are mountain big sagebrush, mountain snowberry, serviceberry, and antelope bitterbrush. The most abundant key browse is mountain big sagebrush which provided 36% and 38% of the browse cover in 1996 and 2001 respectively. When the study was initially established (1984), mountain big sagebrush was decadent in appearance and heavily browsed. On this site, sagebrush is in much poorer condition than it is over most of the surrounding area. Mountain big sagebrush is the shrub that has been most effected by the prolonged drought (late-1980's), especially on south and west aspects. Use on big sagebrush has been moderate to heavy in all years for this study. In 1996, 29% of the population were classified as dead. The proportion of the population classified as dead declined to 13% in 2001. It appears that the population has stabilized and is starting to recover with a decrease in the number of dead and decadent plants since the site was established. Recruitment from young sagebrush plants was much lower than the number of dead in 1996, but the ratio of young to dead improved in 2001.

Snowberry, serviceberry, and bitterbrush combine to produce about one-third of the browse cover in 1996 and 2001. Serviceberry and bitterbrush show moderate to heavy use, good vigor, and low decadence in 1996 and 2001. Snowberry displayed moderate to heavy use in 1996, but lighter use in 2001. Vigor has been normal and decadence low in both 1996 and 2001. Annual leader growth for mountain big sagebrush averaged less than 2 inches in 2001, while bitterbrush and serviceberry averaged 2 inches. Other browse sampled on the site include stickyleaf low rabbitbrush, broom snakeweed, gray horsebrush, and prickly pear cactus.

Grass and forb composition is remarkably diverse but includes many biennial and perennial weeds or species of poor forage value. Many also act as indicators of heavy livestock use. Thistle, aster, western yarrow, common dandelion, bulbous bluegrass, Letterman needlegrass, yellow salsify, flannel mullein, death camas, and wild onion are all examples of increaser species with heavy livestock use. Overall, sum of nested frequency for perennial grasses has slightly increased each year since 1984. Perennial forbs have decreased in sum of nested frequency each year since 1990. Grasses provide about 80% of the herbaceous cover and

nearly half of the total cover on the site in 1996 and 2001. There are over 50 species of herbs on the site, with most of them being classified as increaser species. Herbaceous species that are considered to have good value include bluebunch wheatgrass, crested wheatgrass, thickspike, and Sandberg bluegrass.

1984 APPARENT TREND ASSESSMENT

Soil, although subject to some trampling and compaction from livestock, is not seriously eroded. Ground cover appears to be adequate for protection and has shown no significant change over the past seven years. Trend appears to be stable. Vegetative trend is not clearly indicated by the data. However, there are a few clues, that when used with judgment, permit some preliminary assessments. While overall density of mountain big sagebrush has not definitely declined, there are some indicators pointing in that direction. Furthermore, it is more evident that age and form class structure has deteriorated. There is evidence that increaser grasses, forbs, and shrubs have increased in density and dominance. An overall assessment of vegetative trend from a big game standpoint would be stable to slightly down.

1990 TREND ASSESSMENT

It was noted in the 1984 report that this study was a rather poor site. There may be less sagebrush on this particular spot, but overall it appears representative of the south-facing slope of the foothills above Oakley. It is privately-owned land, managed for cattle grazing by the Oakley Cattlemen's Association. It is also used as winter range by elk and deer. As predicted, mountain big sagebrush had declined on this site and has decreased significantly in numbers between 1984 and 1990. The density plot data indicates that most of the decrease came in the mature age class. Currently, there are abundant seedling and young sagebrush. A majority of the sagebrush are lightly hedged and have good vigor and fair growth in 1990. The other browse on the site have stable or increased numbers. The only shrubs to be uniformly and heavily utilized are the large bitterbrush plants. They are browsed year-round, but still display good vigor. Low rabbitbrush increased on the density plots due to the addition of a large number of young in the population. It is the most numerous browse species.

The seeded and native grasses had a high nested frequency of occurrence. The nested frequency of crested wheatgrass increased significantly, while bluebunch wheatgrass displays a large decrease in frequency. There has also been a shift in forb composition, but the most common species remain hoary aster, thistle, and yarrow, all increasers indicating excessive grazing. Ants, often associated with overgrazing and a large amount of bare soil, are very common on the site. Many of these ants attend aphids that have infested the sagebrush. The site has adequate ground cover and soil protection, but does have an increased percentage of bare soil. However, erosion is minimal on the site.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - slightly up (4)

1996 TREND ASSESSMENT

The trend for soil is slightly upward with a significant decrease in percent bare ground. Furthermore, 63% of the vegetative cover is contributed by herbaceous species which are better at protecting the soil than browse cover. The trend for browse, especially the preferred species, is slightly up with decreases in percent decadency for all species, and an increase in density for mountain big sagebrush which provides 36% of the total browse cover. The nested frequency value for the perennial grasses has increased, but that of the perennial forbs has decreased. However, forbs contribute only 18% of the total herbaceous cover. The

biggest problem for this site is that the majority of the cover for the herbaceous species is contributed by increasers due to excessive grazing. The composition is not ideal for a stable plant community. Trend for herbaceous understory is stable, but of poor composition.

TREND ASSESSMENT
soil - slightly up (4)
browse - slightly up (4)
herbaceous understory - stable, but poor composition with too many increasers (3)

2001 TREND ASSESSMENT

Trend for soil is stable. Vegetation and litter cover remain abundant and well disbursed over the site. The proportion of the surface represented by bare ground remained stable. Trend for browse is stable. The population of mountain big sagebrush shows slight increases in those classified with poor vigor and decadence, but the proportion of the population in the dead age class declined considerably. The population appears to be stabilizing with the mature age class making up three-fourths of the population. Serviceberry, bitterbrush, and snowberry all show stable densities, normal vigor, and low decadence. Trend for the herbaceous understory is stable. Sum of nested frequency for perennial grasses slightly increased, while sum of nested frequency for perennial forbs slightly decreased. Because grasses provide the majority of the forb cover, trend is considered stable overall. The understory remains in poor condition however, as it is dominated by increaser species.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)

HERBACEOUS TRENDS --
Herd unit 06 , Study no: 9

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'84	'90	'96	'01	'84	'90	'96	'01	'96	'01
G	Agropyron cristatum	$_{b}$132	$_{c}$216	$_{a}$71	$_{a}$82	49	80	22	26	2.39	4.20
G	Agropyron dasystachyum	$_{b}$80	$_{a}$17	$_{b}$72	$_{c}$124	29	6	30	46	.74	2.00
G	Agropyron intermedium	-	-	2	-	-	-	1	-	.15	-
G	Agropyron spicatum	$_{b}$47	$_{a}$14	$_{b}$68	$_{a}$15	18	7	28	5	1.48	.60
G	Bromus brizaeformis (a)	-	-	-	3	-	-	-	1	-	.03
G	Bromus inermis	-	13	7	6	-	4	3	2	.18	.18
G	Bromus tectorum (a)	-	-	18	18	-	-	6	7	.22	.06
G	Koeleria cristata	$_{a}$-	$_{a}$-	$_{ab}$4	$_{b}$16	-	-	2	6	.03	.39
G	Poa bulbosa	$_{a}$-	$_{a}$-	$_{b}$135	$_{c}$230	-	-	44	73	6.46	11.66
G	Poa fendleriana	$_{a}$-	$_{ab}$4	$_{ab}$8	$_{b}$10	-	2	3	6	.21	.18
G	Poa pratensis	$_{a}$116	$_{b}$182	$_{b}$182	$_{a}$81	45	63	59	29	4.97	2.01
G	Poa secunda	$_{a}$10	$_{a}$25	$_{a}$17	$_{b}$58	4	12	6	26	.42	.89
G	Sitanion hystrix	-	-	-	5	-	-	-	3	-	.18

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'84	'90	'96	'01	'84	'90	'96	'01	'96	'01
G	Stipa columbiana	$_{b}$133	$_{c}$221	$_{a}$18	$_{a}$6	52	80	6	3	.27	.06
G	Stipa comata	-	-	-	6	-	-	-	3	-	.06
G	Stipa lettermani	$_{a}$-	$_{a}$-	$_{b}$165	$_{b}$176	-	-	58	61	5.61	3.22
Total for Annual Grasses		0	0	18	21	0	0	6	8	0.22	0.09
Total for Perennial Grasses		518	692	749	815	197	254	262	289	22.95	25.68
Total for Grasses		518	692	767	836	197	254	268	297	23.18	25.77
F	Achillea millefolium	52	46	30	30	19	22	13	14	.29	.46
F	Agoseris glauca	-	-	7	-	-	-	2	-	.01	-
F	Allium acuminatum	$_{a}$29	$_{a}$6	$_{a}$14	$_{b}$42	12	3	7	21	.08	.13
F	Alyssum alyssoides (a)	-	-	$_{a}$6	$_{b}$29	-	-	2	14	.01	.14
F	Arabis spp.	$_{a}$-	$_{b}$13	$_{ab}$7	$_{a}$-	-	5	3	-	.01	-
F	Astragalus beckwithii	-	-	2	1	-	-	1	1	.03	.00
F	Aster chilensis	$_{a}$9	$_{b}$34	$_{a}$9	$_{a}$13	5	13	3	6	.18	.42
F	Astragalus convallarius	$_{a}$13	$_{a}$12	$_{a}$5	$_{b}$34	6	7	2	16	.04	.60
F	Balsamorhiza sagittata	-	-	-	-	-	-	-	-	-	.00
F	Calochortus nuttallii	3	11	13	17	2	7	8	7	.04	.20
F	Chenopodium fremontii (a)	-	-	-	3	-	-	-	1	-	.00
F	Cirsium undulatum	$_{c}$137	$_{b}$73	$_{a}$38	$_{a}$24	63	41	23	15	.61	.55
F	Collomia linearis (a)	-	-	-	26	-	-	-	13	-	.06
F	Comandra pallida	$_{a}$15	$_{a}$22	$_{b}$50	$_{a}$30	8	10	26	16	.38	.15
F	Collinsia parviflora (a)	-	-	$_{a}$-	$_{b}$35	-	-	-	13	-	.06
F	Crepis acuminata	6	-	-	-	3	-	-	-	-	-
F	Cruciferae	-	2	-	-	-	1	-	-	-	-
F	Cryptantha spp.	4	-	-	-	2	-	-	-	-	-
F	Cynoglossum officinale	-	2	2	-	-	1	1	-	.03	-
F	Delphinium nuttallianum	-	-	3	-	-	-	1	-	.00	-
F	Epilobium brachycarpum (a)	-	-	$_{a}$-	$_{b}$12	-	-	-	6	-	.05
F	Erigeron pumilus	$_{a}$2	$_{b}$34	$_{b}$41	$_{b}$29	1	17	21	14	.30	.09
F	Eriogonum racemosum	4	15	5	3	3	8	2	2	.01	.01
F	Eriogonum umbellatum	-	-	3	-	-	-	3	-	.01	-
F	Gayophytum ramosissimum (a)	-	-	$_{b}$15	$_{a}$-	-	-	6	-	.05	-
F	Gilia aggregata	-	2	1	-	-	2	1	-	.03	-
F	Hackelia patens	-	-	6	1	-	-	2	1	.30	.00
F	Holosteum umbellatum (a)	-	-	$_{a}$6	$_{b}$40	-	-	2	13	.01	.21
F	Lactuca serriola	-	3	-	-	-	1	-	-	-	-

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'84	'90	'96	'01	'84	'90	'96	'01	'96	'01
F	Lithospermum ruderale	-	2	4	3	-	1	2	1	.03	.03
F	Lupinus argenteus	$_{a}$2	$_{a}$4	$_{b}$22	$_{c}$40	2	2	10	20	.74	1.28
F	Machaeranthera canescens	$_{ab}$70	$_{c}$128	$_{b}$74	$_{a}$19	31	57	38	10	.51	.12
F	Machaeranthera grindelioides	-	-	-	1	-	-	-	1	-	.00
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{b}$68	-	-	-	27	-	.28
F	Navarretia intertexta (a)	-	-	-	3	-	-	-	1	-	.00
F	Orthocarpus tolmiei (a)	-	-	$_{a}$5	$_{b}$30	-	-	2	12	.06	.35
F	Penstemon spp.	-	2	-	-	-	1	-	-	-	-
F	Phlox longifolia	$_{a}$-	$_{b}$22	$_{b}$10	$_{b}$15	-	11	5	8	.05	.04
F	Polygonum douglasii (a)	-	-	$_{b}$81	$_{a}$28	-	-	34	12	.22	.08
F	Ranunculus testiculatus (a)	-	-	$_{a}$3	$_{b}$22	-	-	1	9	.00	.09
F	Senecio integerrimus	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$16	-	-	-	9	-	.15
F	Senecio multilobatus	3	-	-	4	1	-	-	2	-	.01
F	Sphaeralcea coccinea	$_{a}$4	$_{b}$18	$_{ab}$14	$_{ab}$8	2	8	5	3	.31	.06
F	Taraxacum officinale	$_{a}$6	$_{b}$34	$_{ab}$26	$_{ab}$32	3	16	12	18	.21	.26
F	Tragopogon dubius	$_{a}$7	$_{b}$56	$_{a}$25	$_{a}$19	4	28	14	11	.27	.24
F	Unknown forb-annual (a)	-	-	$_{b}$12	$_{a}$-	-	-	5	-	.07	-
F	Verbascum thapsus	11	9	2	-	4	4	1	-	.03	-
F	Vicia americana	$_{a}$-	$_{b}$15	$_{a}$-	$_{a}$-	-	6	-	-	-	-
F	Viguiera multiflora	1	-	-	-	1	-	-	-	-	-
F	Zigadenus paniculatus	-	3	1	8	-	1	1	5	.03	.15
Total for Annual Forbs		0	0	128	296	0	0	52	121	0.43	1.37
Total for Perennial Forbs		378	568	414	389	172	273	207	201	4.59	5.02
Total for Forbs		378	568	542	685	172	273	259	322	5.02	6.40

Values with different subscript letters are significantly different at alpha = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 06 , Study no: 9

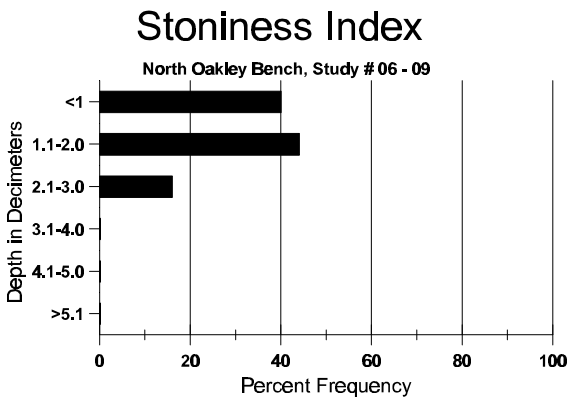
Type	Species	Strip Frequency '96	Strip Frequency '01	Average Cover % '96	Average Cover % '01
B	Amelanchier alnifolia	13	13	.97	1.42
B	Artemisia tridentata vaseyana	55	43	5.86	9.43
B	Chrysothamnus viscidiflorus viscidiflorus	85	86	3.79	6.31
B	Mahonia repens	21	17	.93	.22
B	Opuntia spp.	4	4	.91	.91
B	Purshia tridentata	11	16	.30	.89
B	Symphoricarpos oreophilus	28	25	3.65	5.55
B	Tetradymia canescens	3	2	-	.38
Total for Browse		220	206	16.44	25.13

BASIC COVER --
Herd unit 06 , Study no: 9

Cover Type	Nested Frequency '96	Nested Frequency '01	Average Cover % '84	Average Cover % '90	Average Cover % '96	Average Cover % '01
Vegetation	376	374	7.75	12.00	46.85	55.62
Rock	62	52	2.00	1.50	1.37	1.79
Pavement	152	67	.25	1.50	.91	.32
Litter	389	357	60.50	47.00	39.72	38.70
Cryptogams	70	110	1.25	4.25	.97	2.75
Bare Ground	296	274	28.25	33.75	21.67	21.97

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 09, North Oakley Bench

Effective rooting depth (in)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
9.6	64.4 (19.7)	7.0	38.9	33.1	28.0	4.2	43.8	217.6	.7



PELLET GROUP FREQUENCY --
Herd unit 06 , Study no: 9

Type	Quadrat Frequency		Pellet Transect	
			Pellet Groups per Acre	Days Use per Acre (ha)
	'96	'01	'01	'01
Sheep	1	-	-	-
Rabbit	3	3	9	N/A
Horse	-	3	-	-
Elk	5	21	383	29 (73)
Deer	15	11	252	19 (48)
Cattle	6	12	261	22 (54)

BROWSE CHARACTERISTICS --
Herd unit 06 , Study no: 9

AGE	YR	Form Class (No. of Plants)									Vigor Class				Plants Per Acre	Average (inches)		Total
		1	2	3	4	5	6	7	8	9	1	2	3	4		Ht.	Cr.	
Amelanchier alnifolia																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	1	-	-	-	-	-	1	-	-	-	66			1
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	2	-	-	-	-	-	-	-	1	-	1	-	133			2
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	1	-	-	-	-	-	-	1	-	-	-	66	25	31	1
	96	-	4	7	2	-	-	-	-	-	13	-	-	-	260	25	30	13
	01	-	3	2	-	-	6	-	-	-	11	-	-	-	220	28	34	11
D	84	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	1	-	-	1	-	-	-	2	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	100%	00%	00%	+67%
'90	67%	33%	33%	+29%
'96	29%	50%	00%	- 7%
'01	23%	77%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	66	Dec:	100%
	'90	199		0%
	'96	280		0%
	'01	260		15%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	37	-	-	-	-	-	-	-	-	37	-	-	-	2466			37
	96	6	1	-	-	-	-	-	-	-	7	-	-	-	140			7
	01	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	84	10	5	-	-	-	-	-	-	-	15	-	-	-	1000			15
	90	6	-	1	1	-	-	-	-	-	8	-	-	-	533			8
	96	14	5	-	-	-	-	-	-	-	19	-	-	-	380			19
	01	5	4	-	-	-	-	-	-	-	8	1	-	-	180			9
M	84	4	16	1	-	-	-	-	-	-	21	-	-	-	1400	13	7	21
	90	6	5	-	1	-	-	-	-	-	9	2	1	-	800	14	17	12
	96	22	39	19	-	-	-	-	-	-	73	-	7	-	1600	20	28	80
	01	16	29	13	-	-	3	-	-	-	54	1	6	-	1220	22	35	61
D	84	-	10	9	-	-	-	-	-	-	16	-	3	-	1266			19
	90	1	1	-	-	1	-	-	-	-	2	1	-	-	200			3
	96	-	6	4	-	-	-	-	-	-	7	-	3	-	200			10
	01	4	4	2	-	-	-	-	-	-	3	1	-	6	200			10
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	880			44
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	240			12

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	56%	18%	05%	-58%
'90	30%	04%	04%	+30%
'96	46%	21%	09%	-27%
'01	46%	23%	15%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	3666	Dec:	35%
	'90	1533		13%
	'96	2180		9%
	'01	1600		13%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus viscidiflorus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	17	-	-	-	-	-	-	-	-	17	-	-	-	1133			17
	96	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	22	4	-	-	-	-	-	-	-	25	-	1	-	1733			26
	96	38	-	-	-	-	-	-	-	-	38	-	-	-	760			38
	01	32	-	-	-	-	-	-	-	-	30	2	-	-	640			32
M	84	77	-	-	-	-	-	-	-	-	77	-	-	-	5133	16	15	77
	90	57	29	7	5	-	-	-	-	-	77	-	21	-	6533	9	10	98
	96	276	-	-	14	-	-	-	-	-	290	-	-	-	5800	11	16	290
	01	326	8	-	4	-	-	1	-	-	323	16	-	-	6780	9	16	339
D	84	27	-	-	-	-	-	-	-	-	27	-	-	-	1800			27
	90	17	7	-	1	-	-	-	-	-	15	-	7	3	1666			25
	96	4	1	-	-	-	-	-	-	-	5	-	-	-	100			5
	01	4	-	-	-	-	-	-	-	-	-	3	-	1	80			4
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	+30%
'90	27%	05%	21%	-33%
'96	.30%	00%	00%	+11%
'01	02%	00%	.26%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	6933	Dec:	26%
	'90	9932		17%
	'96	6660		2%
	'01	7500		1%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Mahonia repens																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	16	-	-	-	-	-	-	-	-	16	-	-	-	320			16
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	18	2	-	-	-	-	-	-	-	20	-	-	-	1333			20
	96	252	-	-	-	-	-	-	-	-	252	-	-	-	5040			252
	01	22	-	-	-	-	-	-	-	-	22	-	-	-	440			22
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	1	2	-	6	-	-	-	-	-	9	-	-	-	600	3	4	9
	96	65	-	-	-	-	-	-	-	-	65	-	-	-	1300	3	5	65
	01	176	-	-	-	-	-	-	-	-	176	-	-	-	3520	2	3	176

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	+97%
'90	14%	00%	00%	+70%
'96	00%	00%	00%	-38%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	66	Dec:	-
	'90	1933		-
	'96	6340		-
	'01	3960		-

Opuntia spp.																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80	7	20	4
	01	3	-	-	-	-	-	-	-	-	3	-	-	-	60	4	19	3
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	00%	00%	00%	
'96	00%	00%	00%	+ 0%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	0	Dec:	0%
	'90	0		0%
	'96	80		0%
	'01	80		25%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	84	-	2	1	-	-	-	-	-	-	3	-	-	-	200	30	34	3
	90	-	-	3	-	-	-	-	-	-	3	-	-	-	200	22	41	3
	96	-	1	7	-	4	1	-	-	-	13	-	-	-	260	14	40	13
	01	-	4	2	-	1	6	-	-	-	13	-	-	-	260	11	36	13
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	1	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	50%	25%	00%	+ 0%
'90	00%	100%	00%	- 2%
'96	38%	62%	00%	+19%
'01	31%	56%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	266	Dec:	0%
	'90	266		0%
	'96	260		0%
	'01	320		6%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Symphoricarpos oreophilus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	96	6	-	1	-	-	-	-	-	-	7	-	-	-	140			7
	01	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	84	1	2	-	-	-	-	-	-	-	3	-	-	-	200	11	15	3
	90	-	3	1	-	-	-	-	-	-	4	-	-	-	266	12	14	4
	96	11	19	12	1	-	-	-	-	-	38	5	-	-	860	24	42	43
	01	18	2	1	3	-	-	-	-	-	24	-	-	-	480	29	49	24
D	84	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	1	-	-	-	-	-	-	-	-	-	-	1	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	75%	00%	00%	+43%
'90	57%	14%	14%	+54%
'96	38%	26%	00%	-44%
'01	07%	04%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'84	266	Dec:	25%
'90	465		14%
'96	1000		0%
'01	560		4%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Tetradymia canescens																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
	01	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	1	-	-	-	-	-	-	-	1	-	-	-	66	13	14	1
	96	-	2	-	-	-	-	-	-	-	2	-	-	-	40	11	19	2
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20	9	17	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	+ 0%
'90	100%	00%	00%	- 9%
'96	100%	00%	00%	+ 0%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	66	Dec:	-
	'90	66		-
	'96	60		-
	'01	60		-

Trend Study 6-10-01

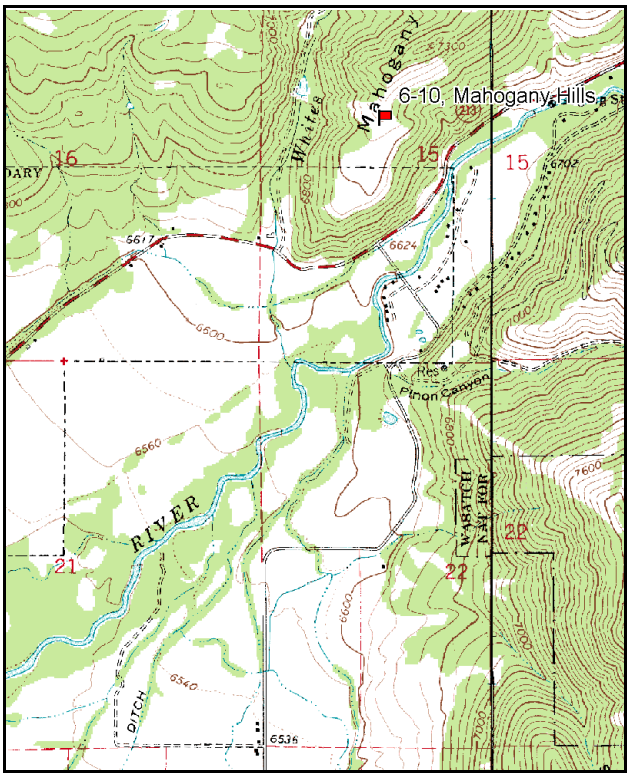
Study site name: Mahogany Hills . Vegetation type: Mountain brush .

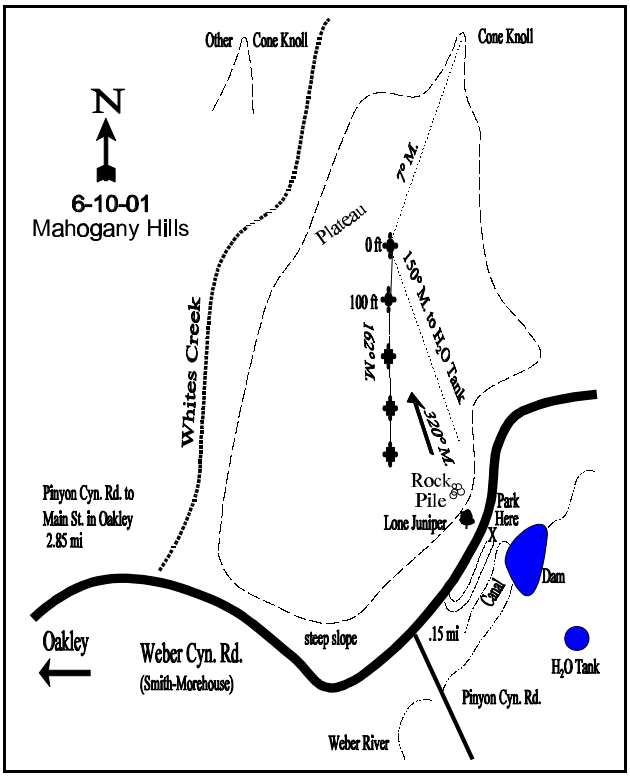
Compass bearing: frequency baseline 162 degrees magnetic.

Frequency belt placement: Line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From Oakley, proceed up Weber Canyon watching for Pinyon Canyon Lane which is a right turn. From this road proceed 0.15 miles farther up Weber Canyon and park opposite a small irrigation canal dam. The main river dam to supply the canal is 100 yards upstream. From the river diversion walk up the steep slope at 273 degrees magnetic to a large lone juniper. From the lone juniper, a rock pile can be found 55 paces at 320 degrees magnetic. From the rock pile, the 0-foot baseline stake is approximately 80 paces at a bearing of 320 degrees magnetic. The 0-foot stake of the is marked by with browse tag #7952. To triangulate on the 0-foot stake when in the middle of plateau: from the stake to a cone-knoll to the north is 7 degree magnetic, from the stake to a water tank on the right at the mouth of Pinyon Canyon is 150 degrees magnetic.





Map Name: Kamas

Diagrammatic Sketch

Township 1S , Range 6E , Section 15

UTM 4509302 N 478425 E

DISCUSSION

Trend Study No. 6-10

The Mahogany Hills study was established in 1984 to sample critical big game winter range at the mouth of the Upper Weber River Canyon. Slope on this study varies from 5% to 12%, aspect is to the south. The site is best categorized as mountain big sagebrush-grass which also contains strong components of the mountain brush type. Elevation at the site is approximately 7,100 feet. Elk use has been moderate on the site, while deer use has been light. A pellet group transect read on the site in 2001 estimated 41 elk days use/acre (101 edu/ha), and 11 deer days use/acre (26 ddu/ha). There appears to be little or no livestock use.

Soil is a reddish color, moderately deep and well-drained. Effective rooting depth (see methods) was estimated at almost 13 inches. The soil texture is classified as a loam with a neutral soil reaction (6.7 pH). In 1996, this site had the highest amount of vegetative and litter cover and the lowest average soil temperature (58.4°F) of all sites within the management unit. It has the best site potential of all the sites on the unit. This area has a diverse plant composition, especially among grasses. Ground cover is excellent. No significant erosion can be detected. An erosion soil condition class assessment completed in 2001 showed soils to be stable.

Mountain big sagebrush dominates the browse component by contributing 45% of the browse cover in 2001. This species has gone through periods of high decadence, ranging from a high of 82% (‘84) to a low of 40% (‘96). In 2001, percent decadence slightly increased to 48%. Sagebrush density was estimated at 4,133 plants/acre during the initial sample in 1984, but has steadily declined since. In 2001, density was estimated at 1,920 plants/acre. Some of the decline in density is likely due to the greatly increased sample size used in 1996 and 2001 which better estimates browse populations. However, the dead age class has made up a significant portion of the population at 21% and 27% in 1996 and 2001 respectively. Density may continue to decline in the future with only half of the population being represented by mature plants in 2001. Recruitment from young plants is also low at less then 5% in all readings. Utilization on mountain big sagebrush has been moderate to heavy for almost all readings, and those classified with poor vigor have averaged 17% the last three sampling periods. Average leader growth on mountain big sagebrush was less than 2 inches in 2001.

The site also contains significant numbers of other valuable browse species that include mountain snowberry, serviceberry, true mountain mahogany, and antelope bitterbrush. These preferred species contribute an additional 43% of the browse cover in 2001. These species display moderate to heavy use, but low percent decadence and normal vigor. Annual leader growth averaged about 2½ inches for serviceberry and mountain mahogany in 2001. Also present are some less desirable shrubs such as stickyleaf low rabbitbrush and gray horsebrush. Stickyleaf low rabbitbrush has shown some dynamic changes in its density, but with very few young in the population, these increases are due mostly to the much larger sample size utilized in 1996, not an actual increase in the population size. Gambel oak density was estimated at 460 stems/acre in 1996, increasing to 1,120 stems/acre in 2001. A late snow storm and cold temperatures in June 2001 killed a lot of the leaf and meristematic biomass provided by oak.

Perennial grasses are a very prominent component on this site, as they provide on average about 34% cover for 1996 and 2001. This represents 86% of the herbaceous understory cover, and 53% of the total vegetative cover on the site in 2001. Of the 15 species of grasses identified on this site, three are seeded species more commonly found in meadows and pastures. Smooth brome is the most obvious example and also the most prevalent grass on the site. It has increased in abundance since 1984. Smooth brome accounts for 72% of the grass cover, 62% of the herbaceous understory cover, and 39% of the total vegetation cover on the site in 2001. Smooth brome is a sod-former and is highly shade tolerant. Within the mountain brush zone, smooth brome can totally dominate and exclude the herbaceous understory and exert a great deal of competition on

shrub recruitment, especially for sagebrush. Sandberg, Kentucky, and mutton bluegrasses are also fairly abundant on the site. Forbs also have a diverse composition and include several palatable and valuable species. Arrowleaf balsamroot, one-flowered helianthella, low penstemon, and redroot eriogonum are preferred forbs in many locations. Sum of nested frequency for perennial grasses and forbs decreased by 15% in 2001.

1984 APPARENT TREND ASSESSMENT

This is a quality site in good condition. Soil trend appears stable with little apparent erosion. A vigorous plant community provides good protection. Vegetative trend looks stable as well. In upcoming years the most important parameter to monitor will be age form and class structure of mountain big sagebrush.

1990 TREND ASSESSMENT

Compared to the wet years when this trend study was established in 1984, the data shows the effects of drought on the site. From the photographic comparisons, there is obviously less production for sagebrush and grass in 1990. The density of sagebrush has decreased, with the number of mature sagebrush increasing due to a decline in percent decadence. A majority of the population is moderately hedged, compared to 61% which were heavily browsed in 1984. Populations of the other palatable, but less common browse were unchanged. Most are now moderately hedged. This site has excellent vegetation and litter cover from high grass frequency and density. There is only 6% bare soil. Smooth brome is thick in the understory. There is a large diversity of forbs that provide a significant forage component. The site contains several palatable species for deer that inhabit the site year-round, especially this year due to its proximity to water. Elk use appears to be moderate in the winter.

TREND ASSESSMENT
soil - stable (3)
browse - stable for sagebrush (3)
herbaceous understory - stable (3)

1996 TREND ASSESSMENT

This site has some of the highest vegetative cover of any site in the area. Litter cover is very high at 75% with percent bare ground declining to less than 6%. Trend for soil is stable and in excellent condition. The browse trend is slightly down for mountain big sagebrush. This appears to be primarily from the very competitive and extremely abundant smooth brome, which is a sod-forming shade-tolerant grass. No seedlings were encountered on any reading and there are basically no safe sites for sagebrush seedlings to become established. The population is becoming more decadent and dying. Twenty-one percent of the population is currently dead. The other browse species are doing much better on the site. The herbaceous understory has improved since 1990 with values for nested frequency increasing for both grasses and forbs.

TREND ASSESSMENT
soil - stable (3)
browse - slightly down for the key browse species (mountain big sagebrush) and stable for the other species of browse (2)
herbaceous understory - slightly up (4)

2001 TREND ASSESSMENT

Trend for soil is stable. Vegetation and litter cover remain high and well disbursed over the site. Bare soil declined to less than 4%. The key browse, mountain big sagebrush, shows a continuing slightly downward trend. Density continues to decline, and decadence is moderately high at 48%. The number of young recruited into the population is low at only 20 plant/acre. This species may continue to decline in the future without an increase in reproductive success, which is unlikely due to the dominance of the site by smooth brome. The other palatable, preferred browse on the site appear stable. Serviceberry, true mountain mahogany, and bitterbrush show stable densities, low decadency, and normal vigor. They also have much more extensive root structure that is more deeply rooted and more competitive with drought conditions. Trend for browse is slightly down overall because mountain big sagebrush is the dominant browse on the site. Trend for the herbaceous understory is slightly down. Sum of nested frequency of perennial grasses and forbs declined by 15% in 2001.

TREND ASSESSMENT
soil - stable (3)
browse - slightly down (2)
herbaceous understory - slightly down (2)

HERBACEOUS TRENDS --
Herd unit 06 , Study no: 10

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'84	'90	'96	'01	'84	'90	'96	'01	'96	'01
G	Agropyron cristatum	11	7	8	5	5	3	4	2	.27	.03
G	Agropyron dasystachyum	13	8	2	17	6	4	1	7	.00	.52
G	Agropyron spicatum	b97	b120	b85	a37	43	47	29	13	2.52	.98
G	Bromus inermis	a159	b217	c278	c293	54	70	79	83	19.99	25.12
G	Bromus tectorum (a)	-	-	-	2	-	-	-	1	-	.00
G	Dactylis glomerata	1	-	5	1	1	-	2	1	.15	.00
G	Koeleria cristata	a-	a-	b33	b19	-	-	12	6	.82	.83
G	Melica bulbosa	-	-	7	-	-	-	2	-	.01	-
G	Phleum pratense	2	-	-	-	1	-	-	-	-	-
G	Poa bulbosa	-	8	9	3	-	3	4	2	.33	.06
G	Poa fendleriana	ab55	a35	ab65	b76	23	17	24	24	2.61	2.40
G	Poa pratensis	80	76	115	70	31	37	43	25	3.40	1.42
G	Poa secunda	a129	ab133	a117	b129	54	55	49	46	2.68	3.29
G	Stipa columbiana	b40	b25	a-	a-	18	10	-	-	-	-
G	Stipa comata	ab8	ab12	b22	a1	4	9	8	1	.58	.03
Total for Annual Grasses		0	0	0	2	0	0	0	1	0	0.00
Total for Perennial Grasses		595	641	746	651	240	255	257	210	33.41	34.70
Total for Grasses		595	641	746	653	240	255	257	211	33.41	34.71

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %	
		'84	'90	'96	'01	'84	'90	'96	'01	'96	'01
F	Achillea millefolium	7	2	1	-	3	2	1	-	.00	-
F	Agoseris glauca	-	-	-	6	-	-	-	2	-	.01
F	Alyssum alyssoides (a)	-	-	14	23	-	-	6	10	.05	.27
F	Allium spp.	$_{a}$-	$_{b}$28	$_{a}$3	$_{a}$4	-	18	3	3	.01	.01
F	Antennaria rosea	1	-	1	-	1	-	1	-	.03	-
F	Arabis spp.	$_{ab}$8	$_{a}$1	$_{b}$17	$_{a}$-	4	1	9	-	.04	-
F	Arenaria spp.	-	4	-	-	-	2	-	-	-	-
F	Artemisia ludoviciana	-	-	3	3	-	-	1	1	.38	.15
F	Astragalus convallarius	$_{a}$4	$_{b}$32	$_{c}$61	$_{bc}$53	3	16	29	28	1.10	.84
F	Balsamorhiza sagittata	10	4	5	9	6	3	3	5	.57	.92
F	Castilleja linariaefolia	6	3	11	2	2	2	6	2	.52	.12
F	Calochortus nuttallii	-	5	-	-	-	4	-	-	-	-
F	Cirsium undulatum	3	4	6	5	2	3	3	2	.07	.15
F	Comandra pallida	$_{a}$-	$_{a}$2	$_{b}$10	$_{a}$2	-	1	5	1	.08	.16
F	Collinsia parviflora (a)	-	-	24	17	-	-	10	7	.12	.06
F	Crepis acuminata	$_{a}$-	$_{c}$97	$_{b}$59	$_{b}$56	-	50	26	31	.56	.60
F	Erigeron pumilus	3	4	5	5	1	2	3	3	.04	.01
F	Eriogonum racemosum	7	11	10	9	4	5	5	6	.24	.13
F	Eriogonum umbellatum	-	-	6	5	-	-	3	2	.12	.06
F	Hackelia patens	$_{c}$88	$_{b}$38	$_{ab}$22	$_{a}$4	45	22	13	2	.24	.03
F	Helianthella uniflora	$_{a}$-	$_{a}$-	$_{b}$29	$_{b}$18	-	-	9	9	1.39	1.51
F	Holosteum umbellatum (a)	-	-	$_{b}$11	$_{a}$3	-	-	5	1	.05	.00
F	Lithospermum ruderale	3	-	7	6	2	-	3	3	.21	.12
F	Microsteris gracilis (a)	-	-	$_{a}$-	$_{b}$15	-	-	-	7	-	.13
F	Orthocarpus tolmiei (a)	-	-	1	7	-	-	1	3	.00	.04
F	Penstemon humilis	$_{b}$11	$_{b}$13	$_{ab}$5	$_{a}$-	5	5	2	-	.06	-
F	Phlox longifolia	-	3	-	3	-	1	-	1	-	.00
F	Polygonum douglasii (a)	-	-	$_{b}$15	$_{a}$-	-	-	9	-	.04	-
F	Schoencrambe linifolia	-	-	2	1	-	-	1	1	.00	.03
F	Senecio integerrimus	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$15	-	-	-	8	-	.10
F	Zigadenus paniculatus	-	-	3	3	-	-	2	1	.01	.03
Total for Annual Forbs		0	0	65	65	0	0	31	28	0.28	0.51
Total for Perennial Forbs		151	251	266	209	78	137	128	111	5.73	5.02
Total for Forbs		151	251	331	274	78	137	159	139	6.01	5.53

Values with different subscript letters are significantly different at alpha = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 06 , Study no: 10

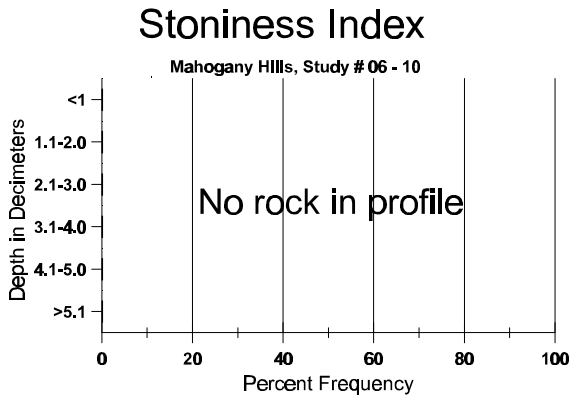
Type	Species	Strip Frequency '96	Strip Frequency '01	Average Cover % '96	Average Cover % '01
B	Amelanchier alnifolia	24	31	3.34	2.84
B	Artemisia tridentata vaseyana	80	69	16.30	11.05
B	Cercocarpus montanus	1	3	1.31	.18
B	Chrysothamnus depressus	4	6	.30	.27
B	Chrysothamnus viscidiflorus viscidiflorus	39	50	2.55	1.41
B	Purshia tridentata	9	10	1.49	1.10
B	Quercus gambelii	7	7	.91	1.08
B	Symphoricarpos oreophilus	54	46	10.48	6.54
B	Tetradymia canescens	4	5	.18	.18
Total for Browse		222	227	36.89	24.68

BASIC COVER --
Herd unit 06 , Study no: 10

Cover Type	Nested Frequency '96	Nested Frequency '01	Average Cover % '84	Average Cover % '90	Average Cover % '96	Average Cover % '01
Vegetation	384	381	5.00	16.50	61.87	61.94
Rock	13	4	.50	0	.05	.03
Pavement	27	19	.50	0	.09	.14
Litter	400	393	80.50	76.00	75.13	70.69
Cryptogams	53	19	.50	.75	.74	.19
Bare Ground	98	52	13.00	6.75	5.88	3.95

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 10, Mahogany Hills

Effective rooting depth (in)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
12.7	58.4 (14.5)	6.7	38.9	35.1	26.0	3.7	32.5	195.2	.6



PELLET GROUP FREQUENCY --
Herd unit 06 , Study no: 10

Type	Quadrat Frequency	
	'96	'01
Elk	22	17
Deer	12	3

Pellet Transect	
Pellet Groups per Acre	Days Use per Acre (ha)
01	01
531	41 (101)
139	11 (26)

BROWSE CHARACTERISTICS --
Herd unit 06 , Study no: 10

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
Y	84	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	1	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	2	9	6	1	1	-	-	-	-	13	5	1	-	380	33	39	19
	01	14	4	6	-	4	6	-	1	-	35	-	-	-	700	33	36	35
D	84	-	-	5	-	-	-	-	-	-	1	-	4	-	333			5
	90	-	2	1	-	-	-	-	-	-	2	-	1	-	200			3
	96	-	6	1	-	2	-	-	-	-	3	6	-	-	180			9
	01	1	2	-	1	-	1	-	-	2	7	-	-	-	140			7

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	100%	67%	-33%
'90	75%	25%	25%	+53%
'96	64%	25%	04%	+36%
'01	23%	34%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'84	399	Dec:		83%
'90	266			75%
'96	560			32%
'01	880			16%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	3	2	-	-	-	-	-	-	-	3	-	2	-	100			5
	01	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
M	84	1	4	6	-	-	-	-	-	-	10	-	1	-	733	32	41	11
	90	2	20	2	2	-	-	-	-	-	25	-	1	-	1733	27	30	26
	96	-	50	22	4	2	-	-	-	-	75	-	3	-	1560	28	39	78
	01	12	26	8	-	-	3	-	-	-	45	1	3	-	980	26	34	49
D	84	2	17	32	-	-	-	-	-	-	35	-	13	3	3400			51
	90	5	17	-	-	-	-	-	-	-	15	-	1	6	1466			22
	96	3	30	17	-	-	6	-	-	-	35	2	14	5	1120			56
	01	7	26	9	2	2	-	-	-	-	29	3	6	8	920			46
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	720			36
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	700			35

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	34%	61%	27%	-21%
'90	76%	04%	16%	-15%
'96	60%	32%	17%	-31%
'01	56%	21%	18%	

Total Plants/Acre (excluding Dead & Seedlings)				
'84	4133	Dec:		82%
'90	3265			45%
'96	2780			40%
'01	1920			48%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Cercocarpus montanus																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	1	-	-	-	-	-	1	-	-	-	20	54	63	1
	01	-	-	1	-	-	-	-	-	1	2	-	-	-	40	40	37	2
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	1	-	-	-	-	-	-	-	-	-	1	66			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	00%	50%	50%	-85%
'96	00%	00%	00%	+67%
'01	00%	67%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	0	Dec:	0%
	'90	132		50%
	'96	20		0%
	'01	60		0%

Chrysothamnus depressus																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	11	-	-	-	-	-	-	-	-	11	-	-	-	220	7	10	11
	01	10	-	-	-	-	-	-	-	-	10	-	-	-	200	8	9	10

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	00%	00%	00%	
'96	00%	00%	00%	- 9%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	0	Dec:	-
	'90	0		-
	'96	220		-
	'01	200		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus viscidiflorus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66	10	13	1
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	66	13	3	1
	96	72	-	-	14	-	-	-	-	-	85	-	-	1	1720	14	16	86
	01	81	-	-	2	-	-	-	-	-	83	-	-	-	1660	12	15	83
D	84	4	-	-	-	-	-	-	-	-	4	-	-	-	266			4
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	-83%
'90	00%	00%	00%	+96%
'96	00%	00%	01%	- 3%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	398	Dec:	67%
	'90	66		0%
	'96	1740		0%
	'01	1680		0%

Opuntia spp.																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	6	9	0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	00%	00%	00%	
'96	00%	00%	00%	
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	0	Dec:	-
	'90	0		-
	'96	0		-
	'01	0		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	-	-	7	-	-	-	-	-	-	4	-	3	-	466	23	39	7
	90	1	3	-	-	-	-	-	-	-	4	-	-	-	266	25	40	4
	96	-	4	5	2	1	-	-	-	-	12	-	-	-	240	16	36	12
	01	-	1	4	3	-	5	-	-	-	13	-	-	-	260	14	34	13

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	100%	43%	-43%
'90	75%	00%	00%	-10%
'96	42%	42%	00%	+14%
'01	07%	64%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'84	466	Dec:		-
'90	266			-
'96	240			-
'01	280			-

Quercus gambelii																		
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	4	-	-	1	-	-	-	-	-	3	-	2	-	100			5
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	3	19	1	-	-	-	-	-	-	23	-	-	-	460	32	22	23
	01	11	31	2	-	-	-	-	-	-	14	-	30	-	880	22	18	44
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	7	-	-	-	-	-	-	-	-	-	-	7	140			7
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	240			12

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	00%	00%	00%	
'96	83%	04%	00%	+59%
'01	68%	04%	70%	

Total Plants/Acre (excluding Dead & Seedlings)			
'84	0	Dec:	0%
'90	0		0%
'96	460		0%
'01	1120		13%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Symphoricarpos oreophilus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	-	-	3	2	-	-	-	-	5	-	-	-	333			5
	96	19	3	-	4	-	-	-	-	-	26	-	-	-	520			26
	01	2	-	-	1	-	-	-	-	-	3	-	-	-	60			3
M	84	16	1	-	-	-	-	-	-	-	17	-	-	-	1133	20	30	17
	90	4	1	-	1	-	-	-	-	-	4	-	2	-	400	22	37	6
	96	101	26	-	15	-	-	-	-	-	142	-	-	-	2840	19	32	142
	01	73	-	-	13	-	-	-	-	-	84	2	-	-	1720	18	36	86
D	84	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	90	-	2	1	5	-	-	-	-	-	4	1	-	3	533			8
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
	01	-	4	-	-	-	-	-	-	-	4	-	-	-	80			4

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	05%	00%	00%	+ 0%
'90	26%	05%	26%	+63%
'96	18%	00%	00%	-45%
'01	04%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	1265	Dec:	5%
	'90	1266		42%
	'96	3380		1%
	'01	1860		4%

Tetradymia canescens																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	3	1	-	-	-	-	-	-	-	4	-	-	-	80	17	18	4
	01	5	-	-	-	-	-	-	-	-	5	-	-	-	100	15	22	5

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	00%	00%	00%	
'96	25%	00%	00%	+20%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	0	Dec:	-
	'90	0		-
	'96	80		-
	'01	100		-

Trend Study 6-12-01

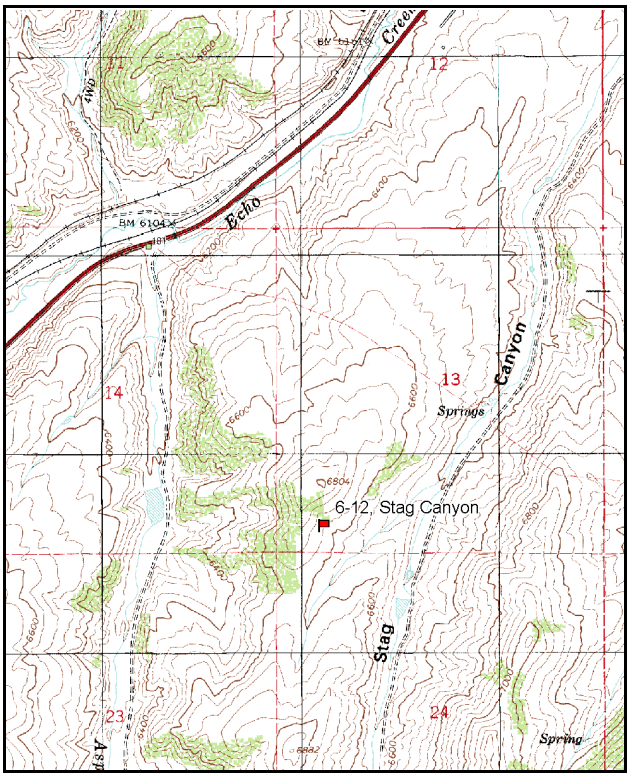
Study site name: Stag Canyon . Vegetation type: Big sagebrush .

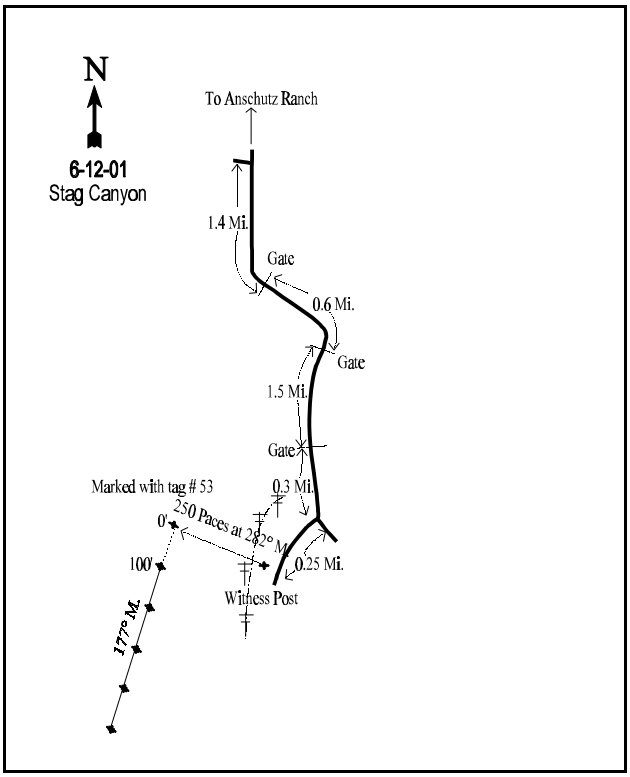
Compass bearing: frequency baseline 177 degrees magnetic.

Frequency belt placement: Line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

Take exit # 185 on I-80, up Echo Canyon and turn right on the frontage road (west). Drive 1.4 miles, turn left, and go through the locked gate (combo from Anshutz Ranch). Go 0.6 miles and turn off to the right through the gate next to the corral. Go 1.5 miles to a gate and proceed 0.3 miles from the gate to a fork. Turn right and drive 0.25 miles to a witness post on the right hand (west) side of the road. From the witness post walk 90 paces at 282 degrees magnetic to the 0-foot baseline stake, marked by browse tag #53. The baseline runs 177 degrees magnetic.





Map Name: Castle Rock Diagrammatic Sketch

Township 4N , Range 6E , Section 13 UTM 4546607 N 481092 E

DISCUSSION

Trend Study No. 6-12

The Stag Canyon study was established in 1996 over concerns of elk use on an old burn. The site has an easterly aspect at an elevation of 6,600 feet. Slope varies from 10-15%. The location of the site was determined by the number elk pellet groups. In 1996, the study area had a pellet group quadrat frequency of 47% for elk, 10% for deer, and 6% for cattle. A pellet group transect read on the site in 2001 estimated 60 elk days use/acre (149 edu/ha), 15 deer days use/acre (36 ddu/ha), and 11 cow days use/acre (27 cdu/ha). Most of the elk pellet groups appeared to be from late winter, while deer pellets were more recent from spring and early summer. Adequate juniper thermal cover is a short distance up the ridge from the site.

Soil texture is classified as sandy clay loam with a slightly alkaline soil reaction (7.4 pH). There is little surface rock (<4%), but there is considerable rock throughout the profile. Average soil temperature was estimated at almost 71° F (at nearly 10 inches in depth), indicating that the site is quite dry and warm during the summer. Litter and vegetative cover values are below average when compared to other sites within the management unit. Bare soil was high at 34% in 1996, increasing to 45% in 2001. There are some signs of minor sheet erosion, but it is limited by the moderately gentle slopes. Even with abundant bare soil, soils appear stable for the most part.

The browse composition consists primarily of mountain big sagebrush and stickyleaf low rabbitbrush. Mountain big sagebrush provided 57% of the browse cover in 1996, increasing to 64% in 2001. The sagebrush population exhibited characteristics of an expanding population in 1996 with a biotic potential of 38% (percentage of seedlings to the population) and a young age class that made up 71% of the population. In 2001, density did increase by 10% to an estimated 5,720 plants/acre. Young plants continue to be abundant in 2001, making up 20% of the population. Most of the young plants occur in the more open areas throughout the site. Sagebrush exhibits very low percent decadence, light use, and normal vigor. Average leader growth on big sagebrush was less than 2 inches in 2001. Increaser species make up the remainder of the browse including stickyleaf low rabbitbrush, broom snakeweed, and prickly pear.

The herbaceous understory is marginal on this site, and best characterized as weedy. The major problem in 1996 was that three species, cheatgrass, thistle, and flannel mullein contributed 64% of the total herbaceous cover. In 2001, all three of these species significantly decreased in nested frequency. Elk will tend to congregate on areas with weedy forbs and select them in the spring. In 2001, sum of nested frequency for perennial grasses slightly increased, while that of perennial forbs drastically decreased. However, the loss of perennial forbs was mostly to the decline in thistle and mullein. Musk thistle was very thick on the road and surrounding meadows coming into the site in 2001.

1996 APPARENT TREND ASSESSMENT

Soils appear stable, but are in only fair condition. Bare ground is abundant, while herbaceous vegetation and litter cover are only marginal. Browse trend appears to be improving with abundant seedling and young sagebrush. Use is light and no decadent plants were sampled. The herbaceous understory is best characterized as weedy. Cheatgrass, thistle, and mullein are the dominate species.

2001 TREND ASSESSMENT

Trend for soil is stable, but remains in only fair condition. Although percent bare ground increased, vegetation and litter cover stayed fairly stable. The nested frequency ratio of bare soil to protective cover (vegetation, litter, and cryptogams) remained at 1:2.3, the same as in 1996. A soil condition class assessment

also determined soils to be stable at the present time. Trend for browse is up. Mountain big sagebrush increased in density, has low decadence, light use, and normal vigor. Young plants remain abundant in the population as well. Trend for the herbaceous understory is stable overall, but remains in poor condition. Although perennial forbs had a drastic decrease in sum of nested frequency, perennial grasses actually increased. Most of the loss in the perennial forb component was due to the decline in two species, thistle and mullein. The significant decline in cheatgrass frequency is also a positive aspect on this site.

TREND ASSESSMENT
soil - stable (3)
browse - up (5)
herbaceous understory - stable but in poor condition (3)

HERBACEOUS TRENDS --
Herd unit 06 , Study no: 12

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover %	
		'96	'01	'96	'01	'96	'01
G	Agropyron dasystachyum	78	91	18	27	2.58	2.12
G	Agropyron spicatum	11	11	6	4	.18	.19
G	Bromus tectorum (a)	272	*154	80	56	4.43	1.85
G	Elymus cinereus	5	5	1	1	.03	.41
G	Oryzopsis hymenoides	57	64	21	26	2.05	1.42
G	Poa fendleriana	-	2	-	1	-	.00
G	Poa pratensis	14	*34	4	11	.45	1.35
G	Poa secunda	10	8	4	4	.12	.05
G	Stipa comata	15	14	6	5	.34	.42
Total for Annual Grasses		272	154	80	56	4.43	1.85
Total for Perennial Grasses		190	229	60	79	5.77	5.99
Total for Grasses		462	383	140	135	10.21	7.84
F	Alyssum alyssoides (a)	103	*342	39	93	.27	3.48
F	Allium spp.	-	2	-	1	-	.00
F	Arabis spp.	2	-	1	-	.00	-
F	Astragalus convallarius	3	9	1	4	.00	.07
F	Astragalus spp.	-	1	-	1	-	.15
F	Astragalus utahensis	2	-	2	-	.03	-
F	Cirsium undulatum	144	*32	59	15	4.98	.51
F	Collomia linearis (a)	-	4	-	1	-	.00
F	Collinsia parviflora (a)	18	*6	10	2	.07	.01
F	Cordylanthus ramosus (a)	1	*19	1	8	.03	.58
F	Epilobium brachycarpum (a)	1	-	1	-	.00	-
F	Erigeron pumilus	3	2	1	1	.00	.00
F	Gayophytum ramosissimum (a)	-	2	-	2	-	.01

Type	Species	Nested Frequency '96	Nested Frequency '01	Quadrat Frequency '96	Quadrat Frequency '01	Average Cover % '96	Average Cover % '01
F	Gilia spp. (a)	-	4	-	1	-	.00
F	Holosteum umbellatum (a)	5	-	2	-	.01	-
F	Lithospermum spp.	-	-	-	-	-	.00
F	Machaeranthera spp	-	1	-	1	-	.15
F	Microsteris gracilis (a)	-	4	-	1	-	.00
F	Phlox longifolia	42	*19	18	9	.19	.09
F	Polygonum douglasii (a)	26	*-	11	-	.05	-
F	Ranunculus testiculatus (a)	5	3	3	1	.01	.00
F	Sisymbrium altissimum (a)	1	-	1	-	.00	-
F	Sphaeralcea coccinea	26	*9	12	5	.28	.05
F	Tragopogon dubius	6	-	2	-	.01	.00
F	Unknown forb-perennial	2	-	1	-	.03	-
F	Verbascum thapsus	59	*17	28	8	2.33	.32
Total for Annual Forbs		160	384	68	109	0.46	4.10
Total for Perennial Forbs		289	92	125	45	7.88	1.37
Total for Forbs		449	476	193	154	8.34	5.48

* Indicates significant difference at alpha = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 06 , Study no: 12

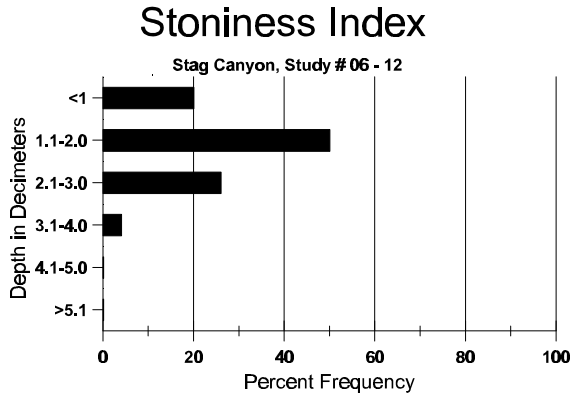
Type	Species	Strip Frequency '96	Strip Frequency '01	Average Cover % '96	Average Cover % '01
B	Artemisia tridentata vaseyana	66	74	9.56	11.69
B	Chrysothamnus viscidiflorus viscidiflorus	59	61	5.48	5.69
B	Gutierrezia sarothrae	35	27	1.61	.86
B	Opuntia spp.	3	3	.15	.03
Total for Browse		163	165	16.80	18.27

BASIC COVER --
Herd unit 06 , Study no: 12

Cover Type	Nested Frequency		Average Cover %	
	'96	'01	'96	'01
Vegetation	405	406	33.05	32.68
Rock	202	112	1.72	1.37
Pavement	264	336	2.63	5.55
Litter	494	457	40.31	36.14
Cryptogams	4	18	.04	.24
Bare Ground	386	391	34.56	45.35

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 12, Stag Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
11.8	70.8 (9.7)	7.4	47.3	26.7	26.0	2.9	11.9	169.6	.7



PELLET GROUP FREQUENCY --
Herd unit 06 , Study no: 12

Type	Quadrat Frequency		Pellet Transect	
	'96	'01	Pellet Groups per Acre ⁄01	Days Use per Acre (ha) ⁄01
Rabbit	3	5	35	N/A
Elk	47	9	783	60 (149)
Deer	10	13	191	15 (36)
Cattle	6	4	131	11 (27)

BROWSE CHARACTERISTICS --
Herd unit 06 , Study no: 12

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	96	98	-	-	-	-	-	-	-	-	98	-	-	-	1960			98
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	96	182	-	-	-	-	-	-	-	-	182	-	-	-	3640			182
	01	83	-	-	-	-	-	1	-	-	84	-	-	-	1680			84
M	96	68	4	1	-	-	-	-	-	-	72	-	1	-	1460	33	40	73
	01	188	7	-	-	-	-	-	-	-	195	-	-	-	3900	30	35	195
D	96	-	-	1	-	-	-	-	-	-	1	-	-	-	20			1
	01	7	-	-	-	-	-	-	-	-	6	-	-	1	140			7
X	96	-	-	-	-	-	-	-	-	-	-	-	-	-	660			33
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'96	02%	.78%	.39%	+10%
'01	02%	00%	.34%	

Total Plants/Acre (excluding Dead & Seedlings)				
'96	5120	Dec:		0%
'01	5720			2%

Chrysothamnus viscidiflorus viscidiflorus																		
S	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	01	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	96	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	96	111	3	1	8	-	-	-	-	-	123	-	-	-	2460	11	23	123
	01	143	-	-	9	-	-	-	-	-	141	11	-	-	3040	9	21	152
D	96	3	3	-	-	-	-	-	-	-	6	-	-	-	120			6
	01	21	-	-	-	-	-	-	-	-	14	-	-	7	420			21

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'96	05%	.75%	00%	+24%
'01	00%	00%	04%	

Total Plants/Acre (excluding Dead & Seedlings)				
'96	2660	Dec:		5%
'01	3480			12%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
Y	96	28	-	-	-	-	-	-	-	-	28	-	-	-	560			28
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	96	126	-	-	-	-	-	-	-	-	126	-	-	-	2520	7	10	126
	01	89	-	-	-	-	-	-	-	-	89	-	-	-	1780	7	11	89
D	96	-	-	-	2	-	-	-	-	-	2	-	-	-	40			2
	01	3	-	-	-	-	-	-	-	-	-	-	-	3	60			3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'96	00%	00%	00%	-41%
'01	00%	00%	03%	

Total Plants/Acre (excluding Dead & Seedlings)				
'96	3120	Dec:		1%
'01	1840			3%

Opuntia spp.																		
M	96	5	-	-	-	-	-	-	-	-	5	-	-	-	100	5	8	5
	01	7	-	-	-	-	-	-	-	-	7	-	-	-	140	4	10	7

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'96	00%	00%	00%	+29%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'96	100	Dec:		-
'01	140			-

Purshia tridentata																		
M	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0	10	63	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'96	00%	00%	00%	
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'96	0	Dec:		-
'01	0			-

SUMMARY

MANAGEMENT UNIT 6 - CHALK CREEK

Of the 11 trend studies in this management unit, nine studies were reread in 2001, and two studies were not read because access through private lands was not obtained. The studies that were not read, Hixon Canyon and South Fork Chalk Creek, will be reevaluated during the next rotation.

Unit Wide Trends

Key browse is limited on several of the trend studies in this management unit. Trend studies at Echo Canyon Rest Area (6-2) and Spring Hollow Burn (6-3) have very little key browse due to fires burning through these areas. Trend studies at Echo Reservoir (6-4) and Spring Canyon (6-5) sample climax Utah juniper communities where key browse species have been nearly eliminated from the vegetation component due to high competition for resources with the juniper.

Cheatgrass decreased in nested frequency on five of the eight studies where it was sampled in 2001. It remained stable on two other studies, and increased on one study due to disturbance (Echo Canyon Rest Area, 6-2). There was no defined pattern in the overall abundance of grasses and forbs in 2001. Sum of nested frequency of perennial grasses and forbs remained stable or increased on about half of the studies in the unit, and decreased on the other half. Annuals grasses decreased on four studies, remained stable on four others, and increased on only one site (Echo Canyon Rest Area, 6-2). Annual forbs increased on five studies, remained stable on two sites, and decreased on two others.

Precipitation

Precipitation data from two weather stations within management unit 6, Echo Dam and Wanship Dam, was analyzed for the past two decades. From 1980-1986, both areas showed above normal annual precipitation, including the severe winters of the early-80's. Four consecutive years of below normal annual precipitation from 1987-1990 provides evidence to references made to extended drought in this and previous range trend studies reports. The early-to-mid-90's brought alternating years of above and below normal annual precipitation. The period from 1995-1998 again brought consecutive years of above normal annual precipitation. The spring and early summer of 2000 and 2001 were both very dry in this area, which helps explain the decline in cheatgrass frequency and/or cover on more than half of the studies in the unit.

Trend Summary

	Category	1984	1990	1996	2001
6-1 Anshutz Ranch	soil	est	3	4	3
	browse	est	3	4	3
	herbaceous understory	est	3	3	2
6-2 Echo Canyon Rest Area	soil			est	2
	browse			est	1
	herbaceous understory			est	3

(1) = down, (2), slightly down, (3) = stable, (4) = slightly up, (5) = up
(est) = site established, (susp) = suspended, (NR) = not read

	Category	1984	1990	1996	2001
6-3 Spring Hollow Burn	soil	est	1	NR	3
	browse	est	1	NR	3
	herbaceous understory	est	3	NR	4
6-4 Echo Reservoir	soil	est	2	4	3
	browse	est	1	1	1
	herbaceous understory	est	4	2	4
6-5 Spring Canyon	soil	est	2	2	3
	browse	est	1	1	1
	herbaceous understory	est	1	3	3
6-6 Hixon Canyon	soil	est	1	3	NR
	browse	est	1	1	NR
	herbaceous understory	est	4	1	NR
6-7 Crandall Canyon	soil	est	1	4	2
	browse	est	1	4	3
	herbaceous understory	est	3	3	3
6-8 South Fork Chalk Creek	soil		est	4	NR
	browse		est	3	NR
	herbaceous understory		est	2	NR
6-9 North Oakley Bench	soil	est	3	4	3
	browse	est	3	4	3
	herbaceous understory	est	4	3	3
6-10 Mahogany Hills	soil	est	3	3	3
	browse	est	3	2	2
	herbaceous understory	est	3	4	2
6-12 Stag Canyon	soil			est	3
	browse			est	5
	herbaceous understory			est	3

(1) = down, (2), slightly down, (3) = stable, (4) = slightly up, (5) = up
(est) = site established, (susp) = suspended, (NR) = not read